ICAN HEALTH PRIMERS

NG LIFE
AND
HOW TO REACH IT

RICHARDSON

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AMERICAN HEALTH PRIMERS.

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AMERICAN HEALTH PRIMERS.

LONG LIFE,

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HOW TO REACH IT.

BY

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LONG LIFE,

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CHAPTER I.

INTRODUCTORY CONSIDERATIONS.

WHEN King Solomon, "the wisest man the world e'er saw," chose wisdom as his portion, *length of days* was accorded him as one of the choicest added gifts which heaven could confer; and the "elixir of life" has been the dream of poets and philosophers from the days of the Chaldean sages down to those of the alchemists and Rosicrucians who flourished some three centuries ago. Yet it is obvious that *longevity*, if it means naught but a greater period of suffering physical pain, or even decided discomfort, is only, humanly speaking, an additional burden, and that therefore, to constitute a real blessing, it must be accompanied by that greatest of all earthly means of happiness—health of body and mind.

For who can deny that the richest prince, the most powerful king, or even the wisest philosopher, if deprived of health, is more miserable than its very meanest possessor.

Of course, it is impossible for me to condense into such a tiny volume as this which you now hold in your hand, full directions for the preservation of health, and avoidance of actual disease in all the various conditions of life upon our planet. I can only hope to present some general rules for the protection of our invaluable bodies, (worth far more to us than an equal weight of the finest gold could ever be,) and a few directions for recognizing and escaping, as far as possible, the thousand external and internal enemies which are ever on the watch to spring upon us in some unguarded moment, and as they are strong or weak, numerous or isolated, either kill us at once outright, or slowly and insidiously undermine our vitality.

According to the inexorable laws of our stern stepmother, Nature, bare existence itself, and still more healthy and comfortable life, is the reward solely of unceasing watchfulness, the prize of a constant struggle, the crown of a merciless warfare, with all the opposing powers and forces which incessantly strive to extinguish our race from the face of the earth. If for a little time the hostility of these adverse influences seems to be lulled into slumber, this peace is a delusive one, and we may be sure that the enemy is

steadily at work sapping the foundations of our citadel of life, and taking advantage of every careless imprudence, every neglect of sanitary ordinances, to plant the seeds of grievous punishment for ourselves or our descendants — seeds which are almost sure, if neglected, to ripen at some future time.

If we consult any register of interments, as, for example, that of Philadelphia for the year 1877, we will find that the mortality from old age (619 out of 16,004, or only about four per cent.,) forms but a very small part of the total number of deaths. The remainder, 15,385, or ninety-six per cent., is made up of deaths from inherited maladies, such as consumption or cancer, together with those from what we may call accidental diseases, such as typhoid fever, diphtheria, cholera-infantum, or small-pox, which cut off about seventy-five people in every hundred, or in the city of Philadelphia, 12,500 persons every year. Now I have *no doubt* — and statistics in regard to the gradually increasing success of sanitary precautions abroad *prove* there can be no doubt—that all of these "accidental" deaths, and a large proportion of the deaths from inherited diseases, might, by proper hygienic management, be absolutely prevented; in other words, that by due attention to the rules of the most perfect science of hygiene, nearly 300,000 inhabitants of the United States might escape dying, as they do, of painful diseases in their youth and

their prime, living out instead the full measure of their usefulness to extreme old age, and then almost without reluctance putting off this mortal life by a nearly painless process of its gradual extinction.

It is true, sanitary science must advance much beyond the point it has at present attained in regard to the prevention of diseases before such a beneficent result is accomplished, and the list of preventable maladies, already a long one and becoming longer and longer every year, must be still further extended; but the fact that so much has been already done, should incite us all to renewed efforts to reduce further still the catalogue of wasted lives, which carelessness, ignorance, or mercenary selfishness annually sacrifice so unnecessarily.

Preventable diseases, which, according to this view of the subject, cost annually with us 300,000 useful lives, and probably twenty times that number, say six million attacks of illness, may, if we except Providential visitations, be chiefly prevented by the proper exercise of mere human care, caution, and foresight, in the adoption of suitable sanitary regulations; and my great object is to point out clearly and plainly what are the most approved sanitary rules under the various contingencies of daily life, and how hygienic measures can, with our present knowledge, be best put into practice, in order to add most, on the one hand, to human happiness, and

most to diminish, on the other, the sad sum total of human suffering in our world. The science of hygiene teaches us the care of the house we live in, just as the science of medicine instructs us how to repair (oft-times very imperfectly) that same house when it becomes damaged through neglect or ignorance. What credit for wisdom would you accord to the owner of a costly mansion who left his doors and windows open during storms, so that the rain and snow could beat in and decay the floors of his tenement; or to one who allowed the furnace-fires to burn so low for want of good fuel, that Jack Frost effected an entrance, and bursting the water-pipes, flooded the whole building; or again to one who, when a portion of the roof was carried away by some accidental tempest, left his attic uncovered to the mid-day sun and the dews of the night? Would you not pronounce such an individual one of the foolish men of the world, one whose folly was so ingrained, that Solomon's experiment of braying him in a mortar must prove quite worthless as an analytic process? And yet such a fool, since he has the chance of buying or renting a new dwelling in perfect order, when his own habitation becomes comfortless or untenantable, is tenfold wiser than he who permits his own body—the body that, sound or damaged, he must always inhabit—to fall out of repair in any way which the most unceasing care and watchfulness can prevent. We physicians, whose life-work

is with the sick and suffering, have impressed upon us daily and hourly the unspeakable value of health, a value which, unfortunately, is often only recognized by members of other professions when too late, and after the blessing of perfect health is forever lost to the unhappy victim of ignorance or wilful disregard of the simplest laws of our nature. That keen old critic of human follies, the poet Juvenal, in his famous Ninth Satire, after describing at length the evils which poison all enjoyment of the usual pursuits and ambitions of mankind, declares that the only boon which we dare ask from Heaven with confident and uplifted face is the

"Mens sana in corpore sano,"

the sound mind in a sound body, which it is the object of this little work to enable you, reader, to obtain and preserve to a good old age.

But this inestimable gift, like everything else that is really valuable in this world, can only be secured by a certain amount of sacrifice on our part. This brings us to a second half-jocose definition of hygiene which I have frequently given, namely, that it is the science which teaches people to take the ounce of prevention instead of the pound of cure. According to Epicurus, the philosopher differs from the unwise man in this—that whilst both seek pleasure, the former has learned how to deny himself certain enjoyments which will

cause him pain and vexation hereafter; whereas a foolish man seeks only the immediate enjoyment, regardless of future pain which may far outbalance to-day's gratification.

Now it would be useless for me to maintain that the ounce of prevention is always, or even generally, agreeable to take; and yet I do not despair of convincing every one of my readers that many portions of this "ounce" are so little unpleasant, and also that they so obviously and immediately enable us to escape that black, bitter dose, the oft unavailing "pound of cure," that to some extent at least they will accept the former gladly, as by far the lesser of two evils, one or the other of which is absolutely inevitable.

Besides, there are many hygienic rules which it is actually pleasanter, from the very first, to live in accordance with than to disregard, and such, at any rate, I hope will be generally obeyed, if they are made clear enough and brief enough for every runner in this headlong race of our nineteenth century to read without pausing in his hurried career.

No small amount of time and trouble has been expended by various writers upon sanitary science in endeavoring to frame an exact and yet comprehensive definition of Health. The most satisfactory with which I am acquainted is one founded upon the lamented Bichat's definition of Life, which he declared

to be Organization (that is, an organized body or part of a body) in action. From this we describe Health as perfect organization in perfect action, and Disease, the divergence from health, as Disturbed organization in disturbed action.

In former ages, both medical men and the community at large looked upon each separate disease as a separate entity, which in some mysterious way fastened upon our vitals, and if not cast out by drugs more potent than itself, destroyed its victims in the struggle for life or death which ensued between it and the life-force of the individual assailed.

At present, however, physicians recognize no such antagonists. Diseases are no longer looked upon as separate existences, but are known to be only disturbances of perfect life, departures from health, which as a rule are gradual in their attack, and even more gradual in their decline; and such terms as to struggle against a disease, or to do battle with a malady, have only a figurative signification, and refer to the causes of complaints, or to the symptoms and effects of an illness, such as the diarrhœa and the weakness which occur in typhoid fever.

According to this view, that Disease is simply a departure from perfect health, the result of some influence outside the body, our attention must of course first be directed to the more important of these external agencies which in turn or simultaneously act

upon us all so as to produce disturbances of, or departures from, absolute health, and consequent reduction of our length of life.

Statistics show beyond all question what important changes towards promotion of longevity have been made, by even a partial obedience to the laws of health, during the last two hundred years. For example, in 1685, not a sickly year, one in twenty of the inhabitants of London died, whilst at present only one in forty dies annually, a reduction of the mortality to one-half. The difference, says Macaulay, between London in the nineteenth and in the seventeenth century is as great as between London during ordinary years and London during the cholera.

Mr. Edwin Chadwick, the famous British sanitarian, declares the experience of sanitary authorities in England, where the dictates of hygiene are much more systematically enforced than they are in this country, demonstrates that in new districts or sites away from the situations of old cities or towns, we may, with a complete system of water supply and surface cleansing, including measures for the prevention of over-crowding, insure a reduction of death-rates to an average rate of ten in every one thousand (that is to say, only one person out of every one hundred would die annually), and the sickness in like proportion — the death-rate in Philadelphia, for example, during healthy years, being about eighteen per thousand.

Also that in well-provided and well-regulated institutions for children from three to fifteen years of age, we may secure them an immunity from the common children's epidemics, and so reduce the death-rates to the average of about three in one thousand, or about two-thirds the death-rates prevalent among children of those ages in the general population.

It has moreover been demonstrated in England, that in prisons, and other such places under effective sanitary supervision, the death-rates have been reduced, among persons from the school-ages and upwards, to about three in the thousand, or to one-third the death-rates prevalent among people at large of the same ages; likewise that to the persons in such institutions an immunity may be given against all ordinary epidemics, typhus fever and the eruptive diseases, diarrhœa and dysentery, which ravage the world outside their walls.

If now such satisfactory results are possible in the attainment of long life and sound health by sanitary regulations enforced upon the ignorant and vicious against their will, what grand successes may we not look for in this country, when free and enlightened people voluntarily practise a wise and intelligent obedience to the laws of hygiene which it is the province of this little book to explain.

CHAPTER II.

CAUSES OF DISEASE, AND HOW TO AVOID THEM.

MANIFESTLY, one of the first steps towards avoiding or escaping the maladies which shorten our lives, and inflict upon us that greatest earthly evil, physical pain, must be to form some acquaintance with the causes of disease and their modes of operation.

Just as the captain of an ocean steamship, in order to bring his charge safely into port, must carefully study his charts, and be prepared to avoid rocks, quicksands, and dangerous currents which menace the security of his costly vessel, so every one of us, if we would navigate our craft into the haven of long life and health, needs all the knowledge which can be acquired in regard to danger imminent, upon the right hand and the left, of our voyage in life, from accident and disease.

Such knowledge of our ever watchful enemies may be obtained in two ways—one by venturing into their haunts, and testing their power upon our own bodies, and the other by trusting to the accounts of our

neighbors, and, according to the sagacious proverb, making "other men's shipwrecks our landmarks." Now it is difficult to believe that there can be two opinions among sensible people as to the relative wisdom of these diverse methods of sailing our ships through the storms of life; and yet experience proves that a large majority of mankind has, in every age of the world, preferred to try dangerous coasts and currents for themselves, instead of steering in the well-known track of comparative safety. Few among us, no doubt, have failed to feel and to yield to this seductive temptation of finding out for ourselves how great the danger is, and whether after all the fear of hearts more cowardly than our own has not exaggerated its perils. How often, too, are we lured on to venture a trial of strength or endurance by the egotistic opinion that we of all men can see the evil consequences in time to turn aside, or, if necessary, draw back and avoid them. Sometimes this can in fact be done, and it will be accomplished with a frequency nearly in proportion to the exactness of our knowledge of the strength, power, and habits of the enemies we have to encounter, and the places where they are likely to be met.

Hence the brief account of causes of disease which I propose to give in this chapter will, I trust, be useful to both classes of individuals — to the wise by pointing out to them the most approved methods of

giving disease-producing influences a wide berth, and to the adventurous by teaching them how to keep a bright lookout for breakers ahead, if they will steer out of a safe course, and how best to sheer off in time with as little injury as possible.

Bearing in mind the definition of health given in the first chapter, namely, "perfect organization in perfect action," and of disease as a departure from health, in other words, as "disturbed organization in disturbed action," it is obvious that causes of disease are any of the innumerable external influences which act upon our bodies, so that they can disturb the natural condition of our organs, or the balance of the functions which they perform. Therefore, excess or privation of the air we breathe, or of the water we drink, and the food we eat, their impurity or partial decomposition, as well as variations in the direction of superabundance or deficiency of the light, the heat, and the electricity which modify the nutrition of our bodies, may, and constantly do, all become potent causes of disease.

Two of the most prolific disturbers of our perfect, and therefore healthy life, are heat and cold, in relation to which it has been said that "heat is life and cold is death." This proverb, however, is only true in regard to the former of these agents in a very limited extent, for, as every one knows, excessive heat is quite as fatal to animal vitality as excessive cold.

These enemies of our well-being are so virulently and sleeplessly in action, that they deserve a separate study as causes of disease, and I shall therefore devote our next chapter to their consideration.

Light, independent of heat, does not seem, when in excess, to have any ill effect upon our systems, except upon the organs of vision. Deficiency of this agent, however, exerts a marked influence in rendering human beings, especially children, dwarfish, stunted, and pallid, obviously wanting in good, rich, red blood. The Italians have an excellent saying to the effect that "where light does not enter, sickness goes in;" and it is probable that even yet we do not fully understand and appreciate the importance of abundance of light, especially to the growing child; although the analogy which many town-bred boys and girls present to the feeble, bleached-out sprouts of a potato developing in a dark cellar, is too close and too painfully suggestive to have escaped general observation. The power of light to accomplish important steps in the life history of the lower animals, is admirably illustrated by an experiment of Dr. Hammond's, in which, by placing a tadpole in a vessel of water secluded from the light, he prevented for one hundred and twenty-five days its development into a frog. At the end of this time, the reptile was removed to a jar exposed to light on all sides, when the transformation at once commenced, and was completed in fifteen

days. Another every-day example of the injurious effects of deprivation of light upon vitality, may be observed in any of our corn-fields in which isolated trees occur, the corn within the shade of the tree being (although not wholly, yet in great measure, on this account) weak, small, and unprolific.

The influence of electrical states of the atmosphere upon the human system is by no means definitely understood, although there is little doubt that it is considerable in amount. In disease, and especially in neuralgic affections, the baleful effects of electrical disturbances in the atmosphere during storms is well marked, and many cases of mental depression, not amounting to insanity, are doubtless modified for better or for worse by electrical conditions surrounding the individuals.

The effects of impure air, impure water, and contagion, including epidemic influence and malaria, as causes of disease, will be made the subject of separate chapters; and it therefore only remains for me to notice in this place a few of the modifying influences of those causes which disturb our health.

The most general, if not the most potent, of these is race. In regard to the subdivisions of the Caucasian race, with which we are chiefly interested in the United States, it has been found that, speaking in a general way, the English and Welsh immigrants seem to be more liable to be affected with scarlet-fever,

diphtheria, croup, apoplexy, and paralysis, and enjoy a comparative immunity from consumption, typhoid and typhus fevers. Among the Irish there is a marked liability to consumption, and an extraordinary mortality from Bright's disease. The Germans show a comparative immunity from consumption, scrofula, and cancer, and a decided liability to small-pox, typhoid and typhus fevers, and other febrile affections. The Swedes, Danes, and Norwegians exhibit a greater tendency to dysentery, diarrhœa, typhoid and other fevers, with a remarkable exemption from apoplexy, paralysis, cancer, Bright's disease, and bronchitis.

The next modifiers of disease-producing agencies are the temperaments, of which four are generally accepted, viz.: sanguine, lymphatic, bilious, and nervous. Persons of a sanguine temperament are believed to be especially liable to organic diseases of the heart, to aneurisms, and to the bursting of blood-vessels in various parts of the body, so that they should especially guard against articles of food and habits of life which promote the formation of an excess of blood in the system. Individuals of lymphatic temperament seem particularly prone to scrofulous affections, consumption, dropsy, and skin diseases. Those of bilious temperament to diseases of the liver, stomach, and intestines, and those of nervous temperament to palsy, St. Vitus's dance, epileptic fits, etc.

Idiosyncrasies, or personal peculiarities in regard, for example, to some article of food or drink, are very common, and deserve careful attention from every one who desires to attain long life and retain good health. Some of them are very curious, as, for instance, the inability to eat shell-fish without suffering from nettle-rash, or the production of vomiting and diarrhœa by small quantities of egg in any form. As, however, every one must learn by experience what his own personal idiosyncrasies are, and will soon be taught how severe is the punishment for violating the laws of his existence in trying to do as others do in these particulars, I need not enter further into their consideration.

A very important modifying influence is age. The seven ages of man, as portrayed by the great dramatist, seem as if they must hold a place in the study of humanity, at least as long as the Anglo-Saxon race endures; but for our purpose it is more convenient to divide the life of man into youth or the period of increase, manhood or the period of maturity, and old age or the period of decay. Croup, scarlet-fever, and other contagious diseases, with bronchitis and pneumonia, are especially fatal in the first of these periods, statistics showing that one-tenth of all children born die during the first month of existence, and that at the termination of the first year after birth only three-fourths remain alive; further, that among city-bred

children nearly one-half die before they reach the age of five years. In the second period, that of maturity, which extends from about the 20th to the 40th year, age modifies favorably almost all the causes of disease, so that the chances of partial or complete escape from their injurious effects are very much increased. Just the contrary, however, holds good in the third period, that of decline, when the general decay of the powers of life renders comparatively slight causes operative in producing dangerous maladies. Some one portion of the human frame, like that of any other machine, is almost always less substantial than the others, and gives way *first*, by its stoppage bringing about the cessation of movement, which we call "life," in all the rest. In this manner the bursting of some little worn-out artery in the brain often produces a stroke of paralysis, or an overworked valve in the heart gives way and proves suddenly fatal, or cancer, which may be looked upon as a mode of premature local death, invades some vital organ and slowly, painfully, and mercilessly drags down its victim to his grave.

Finally, hereditary tendency, often manifested through long series of generations, according to a law which I first formulated eight years ago, as "The Extinction of the Unfit," is a most potent cause and modifying influence of disease. (See *Phila. Medical Times*, Vol. II., p. 1.)

CHAPTER III.

HEAT AND COLD AS CAUSES OF DISEASE.

THE agency of heat and cold in disordering our health is powerful and incessant enough to demand our most watchful care in order to guard ourselves against serious or fatal injury. Up to a certain point, of course, they act as antidotes to each other; and it is a maxim as old as the days of Hippocrates, that the diseases of summer are cured by the approach of winter, and those of winter by the advent of summer.

Taking up, first, the former of these influences, we have to bear in mind that exposure to intense heat, especially, but not necessarily that from the direct rays of the sun, is liable to produce sunstroke, which, as every very hot day in summer proves, is rapidly fatal even in our own temperate zone. The faintness, giddiness, and insensibility have been shown by ingenious experiments to be the immediate effect of heat upon the brain substance, and in order to avoid this enemy of health and long life, exposure to the sun's rays in very hot weather, from 11 to 3 o'clock,

should be abstained from. Wearing a wet handkerchief or sponge, or even a handful of green leaves, in the crown of the hat is a useful precaution against sunstroke; and when slight giddiness or weakness with heat about the head come on, and indicate an approaching attack of serious character, the patient should be at once removed to a cool, shady place, and the head and neck and chest gently rubbed with small pieces of ice so as to reduce the temperature to the natural degree of 98.4° Fahrenheit.

Persons with delicate skins soon learn to save their faces and hands from being blistered in the sun by exercising the wisdom of the adage, "A burnt child dreads the fire."

Upon infants and young children the heated term of our summers is very apt to exert an unfavorable effect in promoting diarrhœa and cholera-infantum. Of course, other causes come into play and aggravate the evil, but there is little doubt that a week, when the daily temperature exceeds 95° Fahrenheit, outherods Herod as a slayer of the innocents.

Extreme cold, even such as we occasionally experience during the winter, is not less fatal in its effects, but it is more commonly a cause of death in proportion as we approach the polar regions.

Cold in its minor degrees gives rise to the painful affections frost-bite and chilblains, the former affecting the nose, ears, and fingers, and the latter the feet.

As Nature's mechanism of keeping any portion of the body warm when surrounded by colder air or water, is by sending hot blood from the heart through it, the wise thing to do when compelled to stay out in severe cold weather is to keep in active movement as much as possible, and so prevent, if we can, any tendency to stagnation of the blood. After prolonged exposure, however, the whole mass of the blood is chilled below its usual temperature, and becoming, therefore, less efficacious as a heating power, as well as less energetic as a stimulant to the heart and the brain, exercise grows extremely difficult, and a disposition to sleep almost uncontrollable.

An admirable illustration of the saying, warmth is life, cold is death, which, by the by, holds good both as regards the whole body and individual parts as the fingers and toes, is given by Captain Cook, in his account of an excursion by Dr. Solander, and nine others, over the hills of Terra del Fuego.

Dr. Solander explained to his companions, before setting out, the ill effects of intense cold, and especially cautioned them against giving way to the strong desire for sleep, with which they would probably be affected, remarking: "Whoever sits down will sleep, and whoever sleeps will wake no more." Notwithstanding all this, he himself was the first to experience this irresistible inclination to rest and sleep, and, in spite of his knowledge of the conse-

quences, he entreated his companions to allow him to lie down. They, however, being aware, from the information he had given them, of the fate to which he would be subjected, urged him forward; but becoming exhausted themselves, were finally obliged to leave him behind with two black servants, who also had grown drowsy. After a little while, however, they returned to Dr. Solander, who was aroused, though with great difficulty, and carried to a fire, which some of the men had succeeded in kindling. Though he had slept but five minutes, Dr. Solander very narrowly escaped death, and for a considerable period afterwards was deprived of the use of his limbs. The two negro men perished.

When only small parts of the body, such as the tip of the nose or the ears, have become frozen, (a misfortune recognizable by the spot turning of a dull yellowish white color,) any serious injury may often be prevented by thawing it very gradually, and for this purpose bathing the affected portion of the system with ice-cold water, or rubbing it with snow, is advisable.

Another method by which cold acts as a disease-producing agent is by checking perspiration, thus preventing the carrying off of injurious worn-out materials of the body by that great avenue of purification, and, as a consequence, throwing more work upon the lungs and other internal organs, the office of which is

largely to perform the labor which the skin is unable or unwilling to accomplish.

Still another and more direct unfavorable effect of cold is the driving of a great part of the blood out of the little blood-vessels, which run everywhere just beneath the surface of the skin, as a mere mechanical result of its contracting and constricting influence. Of course, as this blood which is driven away from the surface must have some place to go to, it flows inwards to the warm parts of the body, which the external cold has not reached; as a necessary consequence filling them too full of blood, or, as it is technically called congesting, one or more of the vital organs. Whichever one of these happens to be our "weak spot," (and there are few of us who can boast of being entirely free from all imperfection of this kind,) is of course the least apt to recover promptly from the temporary congestion so produced, and equally, of course, the most liable to become the seat of a serious inflammation, of which congestion is the first stage. If, for example, a man's lungs are his weak point, inflammation of the lungs, called also lung-fever and pneumonia, running on, if neglected, to consumption, may be the result, or should his intestines be least able to resist an attack of disease, a more or less severe diarrhœa is often the direct consequence of exposure to cold.

The most dangerous times for us to risk sudden

cooling of the surface of the body, are, 1st. During sleep; 2d. When perspiring, after violent exertion or from other causes; and 3d. Soon after taking a warm bath. A majority of us, indeed, can probably trace most of our coughs and colds to want of sufficient care in these respects.

It is a matter of nearly universal observation, too, that draughts of air are highly injurious. So also is the partial application of cold to portions of the body unaccustomed to it. Many persons will begin to sneeze, or become sensible of a sore throat, within a few minutes after being exposed to a current of cold air striking upon the back of the neck. Children and sensitive adults often take cold from the draughts which penetrate around the crevices of windows and doors, no matter how tightly these may seem to be fitted; even sitting too closely to the walls of a room may induce cold, as Pettenkofer has shown that a current of air, to the amount of forty-three gallons per hour, can pass through every square yard of an ordinary brick wall. The effects of cold air are much increased by its association with moisture, on account of the much greater conducting power for heat of the latter.

Another common cause of taking cold is the laying aside of warm, especially of flannel, underclothing, heavy cloth overcoats, etc., too early in the spring, before the wintry weather has entirely left us. Damp articles of clothing, particularly wet shoes and stock-

ings, are probably among the best friends that doctors and druggists have ever had.

Even after one has been careless or foolhardy enough to run the risk of taking a severe cold in one of the ways mentioned above, he can often escape the ill effects of his rashness by removing all damp clothes as quickly as possible, soaking the feet for ten minutes in hot mustard-water, applying a large mustard plaster to his back, and covering up well with blankets in a warm room, so as to produce free perspiration. The flow of perspiration from the skin, under such circumstances, is much promoted by drinking one or two cups of hot tea, for example, chamomile or boneset, and such home remedies, if thoroughly and, above all, promptly applied, will often prevent a serious illness.

CHAPTER IV.

CONTAGION, AND HOW TO ESCAPE IT.

CONTAGION, a name derived from the two Latin words, *con* and *tango*, to touch together, is the term applied to the material in consequence of which a healthy person touching a diseased one may have conveyed to him the disease with which the latter individual is affected. The word infection is applied to the substance or influence by which a malady is transmitted from one person to another, either with or without actual contact. The type of *infectious* diseases is small-pox, and it is also, as is well known, a highly *contagious* complaint. Scarlet-fever, measles, whooping-cough, mumps, etc., are likewise both contagious and infectious, and make up the class of disorders popularly known as diseases which are "catching." Besides the complaints already mentioned as undoubtedly infectious, there are several others, such as typhus fever, typhoid fever, yellow fever, and diphtheria, which are strongly suspected to be, at least under certain unknown circumstances, capable of transmission in the same way from diseased to

healthy persons; and it is therefore wise to take the same precautions against catching them as against the poisons by which the first-mentioned groups are probably disseminated.

The importance of learning how to avoid the contagion of these diseases is shown by the fact that in Philadelphia, during 1877, out of a total number of 16,004 deaths in a population of about 850,000, there were 155 deaths from small-pox, 379 from scarlet-fever, 69 from measles, 81 from whooping-cough, 542 from typhoid fever, and 458 from diphtheria. Of course, these deaths represent, in each instance, a much greater number, probably at least ten times as many non-fatal cases of each disease.

Numerous and violent are the controversies which have been waged, and are now carried on, in regard to the true nature of contagion; but without entering into them, I will just say, that by far the most probable doctrine is that set forth in the germ theory of disease, which is briefly as follows:

This hypothesis, attributed by some to Pliny, and without doubt ably advocated by the celebrated Linnæus more than a century ago, professes to account for the symptoms of the contagious diseases by attributing them to the more or less mechanical irritation of groups of microscopic plants developing in the blood, the skin, and the vital organs of affected persons. The period of incubation (by which is meant the time between exposure to small-pox, for

example, and the outbreak of the complaint) is supposed to correspond with the time required for the sprouting of the seeds of these minute plants within the body. The gradual increase in severity of the symptoms is attributed to the progressive growth of millions of tiny vegetable organisms whose period of greatest luxuriance marks the height of the attack, and the death and destruction of which correspond to the decline of the disease. The contagiousness of the communicable maladies is accounted for, as you see, very beautifully by the existence of the immense number of almost inconceivably small seeds (truly the seeds of disease) constantly produced, given off from the sick patient, and carried through the air of a room or house, either alone or attached to some of the innumerable epithelial scales which are all the time being rubbed off, as dandruff, etc., from our bodies. The general absence of second attacks is admirably explained by the hypothesis that the parasitic fungus, on the first occasion, has exhausted all, or nearly all, of some peculiar unknown organic ingredient in our systems which is absolutely requisite for its support, according to the very same law which will entail, as every farmer knows, the failure of his wheat if he plants it repeatedly in the same ground, and neglects to secure a due rotation of crops.*

* See my Lecture on the Germ Theory of Disease, published by the Social Science Association of Philadelphia, in The Penn Monthly, November, 1878.

Every individual afflicted with small-pox, scarlet-fever, or any other of the diseases above mentioned, is, according to this germ theory, to be looked upon as a sort of hot-bed or forcing-house, for the seeds or spores (as they are called) of that malady. From his or her body are continually given off in all directions, from the skin, the breath, the perspiration, and the other secretions, millions of spores so minute that twenty thousand of them, placed end to end, would not measure an inch in length, and a group of them the size of an ordinary grain of sand might contain fifty millions. Each one of these infinitely minute seeds, if it were received into a human system under favorable circumstances, would rapidly reproduce itself, and after a few days or weeks, corresponding, as already mentioned, to the period of incubation, give rise to a new case of disease; again a new hot-bed for other unprotected persons.

Now these spores, just like the seeds of larger noxious weeds which, when allowed to gain a foothold in our fields and gardens, propagate themselves with such immense rapidity, have no power to move of their own accord, and can only develop if they meet with air moisture and congenial soil suited to their peculiar requirements. That is to say, if the contagion of small-pox is not wafted by the air so as to reach any unvaccinated person before it loses its vitality, if, in other words, the seeds of this loathe-

some disease do not fall upon good ground, then, and then only, no harm is done to mankind.

This brings me to the notice of one of the most common and most mischievous popular errors which a general acceptance of the germ theory will necessarily subvert, namely, the belief that small-pox and other contagious maladies often arise without previous exposure to the seeds of disease. This doctrine, frequently advanced in private life as an excuse for neglect of proper care and caution in regard to children, etc., and occasionally sustained by public authorities as an apology for violation of quarantine and other sanitary regulations, is exceedingly pernicious. I firmly believe that in our own day at least every new case of the contagious maladies already enumerated is the immediate offspring of a preceding case, and the direct result of exposure of an unprotected human being to the chance of having the seeds or spores of disease implanted in his system, an exposure which it only required sufficient knowledge, sufficient foresight, and sufficient care to avoid.

No doubt many of my readers will feel inclined to say that they are personally acquainted with instances where diseases commonly recognized as contagious have arisen without any known exposure to other patients, sick with the same malady, from whom they could have caught the complaint. I admit that many such examples do occur, but contend that with our

present means of detecting the poison of such affections, which is invisible to the ordinary powers of the best microscopes, such must necessarily be the case. When, however, circumstances enable us to be sure that not even particles so minute as those I have described as the germs of disease can be disseminated, we find there occur no such outbreaks of contagious maladies whilst the conditions remain unaltered. This truth is admirably illustrated in the epidemic of measles which appeared in the Faroe Islands, an isolated group in the North Sea. For sixty-five years the inhabitants of these islands had been free from measles, when, on the 1st of April, 1846, a workman from Copenhagen, who had arrived three days before, fell ill with this disease. His two most intimate friends were next attacked, and from that time the malady was traced by Dr. Pannum, the Danish commissioner, from hamlet to hamlet, and from island to island, until 6,000 out of a total population of 7,782 had been affected by it. Age brought no safety from the contagion, though the disease was found to spare all those who in their childhood had suffered from it at the time of the previous epidemic more than sixty years before. The "shot-gun quarantines" in the South last year, when *mercilessly* enforced, always succeeded in keeping out Yellow Fever.

Contagion is often very capricious. Occasionally, in a family of children, one will be very ill with

scarlet-fever, and the rest, although exposed to the seeds of the disease, will escape without being infected; at other times, all the members of a household, except those protected by previous attack, will take the malady in spite of ordinary precautions to seclude the affected child from his brothers or sisters. This variety of behavior is, no doubt, due to some constitutional peculiarity, either temporary or permanent, and has its complete analogy among the larger plants, certain weeds or flowers growing with great luxuriance in particular places and soils, but utterly failing to establish themselves in other and apparently similar localities.

The contagion of small-pox is probably the most virulent of any that we have ordinarily to deal with, and, but for the immortal discovery of vaccination by Dr. Jenner, would, perhaps, have continued to prevail as a terrible scourge of our race. People of the present day, who complain of the temporary inconvenience, and almost infinitesimal danger of vaccination, can only do so through ignorance of the horrible suffering, disgusting deformity, and appalling mortality which attended small-pox in former times. It is estimated that in England, during the eighteenth century, nearly one-third of all the inhabitants, ladies included, were pitted with small-pox, which caused about ten per cent. of all the deaths taking place every year. The mortality was so great, that one out of

every four, and in some epidemics, one out of every three attacked, died of this disgusting malady; and when we remember that every one seized with it became immediately an object of danger, dread, and loathing to his best friends and nearest relations, and if he or she recovered, was generally rendered repulsive, or even disgusting for life, we can faintly realize what a blessing Jenner's discovery has been to the world.

The method then to avoid the contagion of small-pox is to be vaccinated and revaccinated, at intervals of about seven years, or even oftener, if the disease happens to be unusually prevalent. Every child should be vaccinated at the age of from six weeks to three months (or sooner, if there is small-pox in the neighborhood), with fresh vaccine matter direct from healthy calves, in order to avoid any possible contamination with the poison of human constitutional diseases. Such virus can now be procured in all of our large cities, and if obtained from responsible dealers is, I believe, quite reliable. The operation should be repeated until it "takes" perfectly, and is an imperative duty which every parent or guardian owes to his child, as well as to the community at large, without a day's delay, beyond the time above indicated, as that suited for its performance. If each parent or guardian who reads these lines, whilst an unvaccinated infant lives beneath his roof, will but con-

sider for a moment what a life-long sorrow it would be to see, day after day, that dear little innocent face scarred and disfigured by small-pox *always*, simply in consequence of carelessness or neglect to protect it from the destroyer in time, I believe we might soon hope to behold the last of this dreadful malady. Revaccination is necessary, because although in a majority of instances a single perfect vaccination protects through life, in a minority of cases, this security becomes less and less with advancing years, and as yet we have no means of distinguishing these unfortunate individuals of the latter class, except by reinserting the virus.

As a rule the operation of vaccination is performed in boys upon the left forearm, just below the elbow; in girls upon the arm, a little below the shoulder; this latter difference being a concession made to fashion, at the risk of slight, but positive additional danger to the infant. In England and on the continent, two, three or more punctures or groups of scratches are made, and some recent observations seem to indicate that a greater security is thus insured against small-pox. The method here in vogue of lightly scratching the skin, by repeated gentle touches of a very sharp lancet, is so nearly painless that by a little management the most timid child can generally be induced to submit to the operation without complaint. Compulsory vaccination is established by law

in the British Empire, and the ordinance is strictly enforced by the imposition of fine or imprisonment upon delinquents. Such a plan ought, by all means, to be adopted in this country, and as a step towards this desirable object, our public schools should admit no child who has not been thoroughly vaccinated. This rule would have the great additional advantage of rendering schools almost entirely safe from varioloid as well as small-pox.

Small-pox occurring in persons partially protected by a long previous vaccination, is generally rendered much milder, and is called varioloid or modified small-pox. This modification is seldom fatal and does not often leave unsightly scars. It is, however, capable of giving genuine small-pox to unprotected persons.

The contagion of small-pox is extremely active, spreading readily throughout a house, and often to neighboring dwellings. It may be conveyed by the breath of a person affected with it before any eruption appears, and has been caught from a dead body twelve days after decease. It may be transmitted for long distances in clothing, bedding, letters, etc., unless great care is taken to ventilate and disinfect the same. As it is often propagated by unscrupulous persons travelling in boats, cars, stages, etc., whilst sick with mild forms of small-pox or varioloid, I would advise every one to examine carefully, at the first op-

portunity, a vaccine pock upon a child's arm five, six, or seven days after a successful vaccination, and then studiously avoid proximity to any strangers having similar eruptions upon their skin. In England, stringent laws are enforced against those who criminally endanger the public health by thus running the risk of disseminating the poison of small-pox or other contagious diseases; and I trust that before long similar protection to the community will be afforded by the legislators of our several States. Such ordinances, whilst involving inconvenience, or even hardship, to sufferers from these maladies, would be strictly in accordance with the grand Democratic principle of securing "the greatest good for the greatest number," which is so firmly established here in America.

A certain horrible contagious disease is sometimes conveyed to innocent persons, especially children, by their lips being touched to drinking cups, gum nipples, whistles, etc., which have been contaminated by the mouths or hands of persons infected with it, so that ladies, parents and nurses cannot be too careful to guard against danger of this kind.

As we have, unfortunately, no such safeguards as vaccination against the other contagious diseases, such as scarlet-fever, measles, etc., precautions against entering the sphere of their influence become doubly important, especially during epidemics of unusual fatality, or at times when our systems are enfeebled

in any way by other maladies or unfavorable conditions. These diseases are very apt to be propagated among school children by the return of scholars recovering from measles or diphtheria, for example, before the poison has entirely passed off from their bodies, and without proper purification of their clothing; a pernicious practice which should also be legislated against, but which can only be fully abolished by the action of enlightened public opinion in regard to the injustice and criminality of such acts. No individual who has suffered from measles or diphtheria (which may be so mild as to pass for slight sore throat) can safely associate with others in less than two weeks from the date of complete recovery, and a period of from four to six weeks should elapse after an attack of scarlet-fever before contact is allowed with children who have not been protected by a previous attack. Clothing, especially woollen fabrics, if not purified by thorough ventilation and disinfection, has been known to convey scarlet-fever one, two, or even three years after it was impregnated with the contagion of this disease.

With such knowledge of the laws of propagation of the infectious maladies, it is obvious that the study of disinfection, or the destruction of the contagious material, be it vegetable, animal, or mineral, becomes of the gravest importance. Many persons, including, I am sorry to say, not a few physicians, seem to think

that if they make an article of dress, a room, or a hospital smell badly of carbolic acid or chloride of lime, they have accomplished disinfection, but such is often by no means the case. From a series of very carefully conducted experiments, Dr. Baxter has lately concluded that no sewage or other virulent liquid can be regarded as surely and entirely disinfected by sulphurous acid, unless enough of the gas from burning sulphur is absorbed by it to render it permanently and strongly acid to litmus paper. Also, that no similar virulent fluid can be considered disinfected by carbolic acid unless it contains two per cent., or about one ounce, of the pure acid in every three pints of liquid. According to the same authority, aerial disinfection, as commonly practised with carbolic acid or chloride of lime, is useless or positively objectionable.

When any member of a family is attacked with small-pox, scarlet-fever, diphtheria, or other contagious disease, the malady may generally be prevented from extending by attention to the following rules, which I have modified somewhat from those advised by our local Board of Health.

Have the patient placed in one of the upper rooms of the house, the furthest removed from the rest of the family, where the best ventilation and isolation are to be had. He should be under the *sole* charge of a nurse who is protected by a previous attack of

the disease. The apartment should be at once cleared of all curtains, carpets, woollen goods, and unnecessary furniture. To secure the utmost cleanliness, provide a basin partly filled with chloride of lime or strong carbolic acid solution (a teaspoonful of acid to a half pint of water) for the patient to spit in. Change the clothing and bedding of the patient as often as needful, but never let the cast-off articles be carried dry through the house. A large tub containing carbolic acid solution (four fluidounces of Calvert's No. 4 to each gallon of water) should always stand in the room, for the reception of bed or body linen immediately after its being removed from contact with the patient. The nurse should wear in the chamber a loose gown and tight-fitting cap, to be thrown off at the door, and the hands should be washed, before going out, with the carbolic acid water. Pocket-handkerchiefs and napkins should not be used, but in their stead pieces of rag, which can be at once burned. Glasses, cups, dishes, etc., must be scrupulously cleaned in the carbolic acid solution, or in boiling water, before they are carried away from the room. The discharges from the bowels and kidneys are to be received *on their very issue from the body* into vessels containing some disinfectant, such as a solution of two pounds of green vitriol (sulphate of iron) in a gallon of water, or the carbolic solution, and immediately removed. A sheet, kept moistened

with carbolic acid solution (double strength, or half a pint to the gallon), should be hung over the door outside, or beyond in the passage-way, for the purpose of catching any germs of the disease which might otherwise escape.

Boiling is the surest way of disinfecting contaminated clothing, or it may be baked in an oven heated to about 240° Fahrenheit. After the disease is over, the patient should be kept isolated for ten days after all the scabs fall off in small-pox, or after desquamation (that is, "peeling" of the skin) is complete in scarlet-fever; for the last week of his seclusion, daily baths, each containing one ounce of strong carbolic acid, should be given, and every square inch of the body must be thus carefully disinfected, especially the scalp, as the disease-poison is apt to linger among the dandruff at the roots of the hair.

To purify the apartment, wash the furniture, woodwork, floor, and walls (scraping off the paper) with the carbolic acid solution and soap. Then shut up tightly, and burn in it a pound of sulphur for every hundred cubic feet of space it contains, and allow the fumes to remain in the closed room for twenty-four hours. Lastly, open doors and windows so as to ventilate freely for a week, at the end of which time disinfection may generally be considered complete.

CHAPTER V.

CLOTHING, AND HOW TO WEAR IT.

ONE of the principal defensive weapons which man employs in his struggle for existence, particularly in the north temperate and frigid zones of our planet, is his clothing. Although people generally speak of clothes from a moral and an ornamental point of view, ignoring to a great extent their main purpose, which is to preserve our health and long life, this latter mode of considering them ought to have the great pre-eminence. That such is not the case is very unfortunate, because forgetfulness of the chief end of dress, the purely hygienic one, has subjected mankind, and especially womankind, to the rule of trivial and frivolous regulations, so that the manners and fashions of the period frequently control to a great extent the hygienic fitness of clothing.

According to theologians, clothes were instituted to cover our nakedness, but physiologists declare that their chief object is to protect us from outside influences; with the climate and region in which they are worn, they vary from thick suits of furs to rags

around the loins, and the development of dress and the part it has taken in the history of civilization form no unimportant subject of research for the scientific student of mankind.

To understand the true philosophy of dress, we must remember that the human body, exposed to a cool atmosphere, at once begins to lose heat in three ways: 1st, by radiation; 2d, by evaporation of surface moisture; and 3d, by conduction, or direct conveyance of heat to particles of air immediately in contact with it. If now we cover our bodies with any fabric, we necessarily interfere with all three of these modes of cooling; but this obstruction is only a marked one for the few seconds or minutes required for the clothing itself to become heated. As soon as this is accomplished we begin again to cool off, although less rapidly than before, because radiation from our "artificial surface" (as the outside of our garments is called) can only take place as fast as heat is carried to it by the relatively slow process of conduction through our clothes.

The rate of conduction varies from that of a thin linen coat, in which it is very great, to that of a thick fur cloak, wherein it is very small, and upon this difference in conducting power the relative value of different articles of dress depends.

Clothes also add marvellously to our comfort by enabling us to change the place where the loss of heat

into the surrounding air occurs, from our own sensitive skins to the insensible exterior of our "artificial surface." In this way we avoid driving the blood from the outer portion of the body to vital organs, and so producing pneumonia, inflammation of the kidney, or Bright's disease, etc. Now, the process of hardening one's self, as it is popularly called, consists really, 1st, in making one's cutaneous nerves accustomed to bear changes to a lower temperature without such violent spasmodic action as sends a large amount of blood to the inner parts of the body; and 2d, in rendering the vital organs so used to a rapid influx of blood into them that they tolerate the congestion without so much danger of serious injury. The operation is, therefore, exactly similar to getting our eyes accustomed to a strong light, or our ears to a loud noise, both of which are disagreeable or even painful at first in their effect.

Making ourselves tender, on the other hand, is allowing our nerves to grow so unused to the stimulating influences of cold, and our lungs, etc., to become such strangers to the rapid influx of blood into them which cold produces, that when such a cause of disease has a chance to act upon us, not only is the rush of blood more violent, but its effect is more pernicious and serious, and congestions or inflammations are apt to be the result.

By careful adaptation of the thickness of our clothes

to the coldness of the weather, we can of course avoid, to a great extent, the necessity of becoming hardened to changes of external temperature, because we can actually prevent cold air from coming in contact with any considerable portion of our skins; but how far it is advisable for us to allow ourselves to become tender in this manner, is a debated point among sanitary scientists. My advice is for each to determine the question for himself, by trying cautiously, when in full health, how far he can bear exposure to winter's cold without injury; but of course such experiments should not be undertaken by those in whom any dangerous hereditary tendency, as, for example, to consumption, exists.

Many individuals find that in mild seasons they can endure going out without an overcoat up to the middle or end of December, until, after some unusually prolonged exposure, or an exposure whilst otherwise out of health, they take cold, and are obliged to envelop themselves carefully and thickly for the rest of the winter. Few sanitary rules, in fact, require obedience more inexorably than that which commands us, after having once commenced with a certain thickness of outside winter wraps, to continue with the same until spring returns. I have myself, on one occasion, suffered a severe cold and sore throat from wearing a thinner neck-tie than usual on a winter's day. It is probable that thousands of cases

of consumption among females take their rise from the exposure of the neck and upper part of the chest to cold air, by the costume absurdly called "full dress" in fashionable society.

But not only is the danger of laying the seeds of disease from passing into cold air whilst too thinly clad to be considered, but we must remember that to keep up the heat of the body without the aid of warm clothing in winter, requires a great expenditure of nervous energy, which in turn is the equivalent of a large amount of life-force. Some individuals seem to be possessed with a sort of mania for hardening themselves and their families, in apparent ignorance of the fact, that to counteract the influence of cold without the aid of broadcloth and furs requires this great waste of nervous force, which, if not so exhausted, might be applied to far higher purposes. Had the nervous fluid which gave activity to the reasoning faculties of Sir Isaac Newton's brain, on that autumn day when he saw the apple fall from the tree, been called away from his cerebrum to energize the nerves of his skin in consequence of his being too thinly clothed, we might never have had the discovery of gravitation which has made his name so illustrious. Not only is it superfluous, but positively injurious, to exhaust our powers unnecessarily, when mere mechanical appliances, like clothing, will obviate the continuous expenditure of vital energy.

Practically, persons in ordinary good health will find it much more convenient to have all the different coats or dresses, intended to be worn about the same time of year, nearly equal in thickness, as a change to even a slightly thinner article of clothing is very apt to involve a severe cold, unless it is made exactly in correspondence with a rise in the thermometer. Leaving off warm clothing too early in the spring is well known to be a common cause of coughs and colds.

Another way in which clothes save the wear and tear of our bodies is by diminishing the amount of heat our systems must produce by the oxidation of elements of food; and it is thus that, as the great Dr. Liebig expressed it, our clothing is merely an equivalent for a certain amount of nutriment — the more thickly we are clad the less urgent becomes the appetite for food, because the loss of heat by cooling, and consequently the amount of heat to be supplied by food, is diminished. Since oily food furnishes, during its digestion and assimilation, the largest amount of heat, it is an especial favorite among the inhabitants of cold climates, and the amount of fat required by the Esquimaux, in addition to their fur-lined garments, to enable them to withstand the rigor of a Polar winter, is proverbial.

Flannel under-clothing should be worn during the winter months in this climate by every one after the

age of forty years, and is advisable for younger persons who are not in robust health. Occasionally it is found to irritate very delicate skins, but this disadvantage may be avoided by wearing it outside of linen or muslin under-clothes, or by employing flannel lined with silk.

As a protection against cold, for equal thicknesses wool is much superior to both cotton and linen. It has been found by direct experiment that a tin vessel filled with boiling water, and covered with woollen cloth, takes much longer to cool off than a similar one wrapped in cotton or linen fabric.

In tropical regions, where clothing is required largely as a protection against heat, we find that texture has little to do with its efficacy as regards direct rays of the sun. The main consideration being the color of the fabric, the best garments being white, then gray, yellow, pink, and blue, and black is worst of all. When not exposed to the rays of the sun, this effect of color is not marked, and the thickness and conducting power of the material, especially the former of these conditions, are those which influence heat.

When we wish to secure protection against cold winds, leather and India-rubber prove the most useful; next come woollen goods, and last, a great way behind, may be reckoned cotton and linen fabrics. Clothing made of wool can absorb a far larger amount

of perspiration, with less danger of the wearer's taking cold from its moist contact with his skin, than any of the other materials of dress ordinarily employed.

One of the best popular axioms in regard to health urges that we should always keep the head cool and the feet warm. To this latter injunction I would add "and dry," by way of emphasizing the importance of avoiding wet shoes or boots, and consequently cold feet.

Hats and bonnets should therefore be comparatively light in texture, not fitting so tight as to interfere with the circulation through the scalp, or give rise to headache by pressure upon the nerves around the crown of the head; and in winter, if more than one is worn, all should be of exactly the same thickness, or at least identical in their power of preventing loss of heat.

Boots and shoes should have broad, low heels, and be loose enough to avoid corns (which are almost always the result of trying to wear too narrow soles and too high heels), and yet not so loose as to give rise to excoriation from friction upon projecting portions of the foot. Neglect of this latter precaution sometimes gives rise to troublesome and intractable sores. Wearing India-rubber shoes in rainy, or especially snowy weather, is probably the best method of avoiding the dangers of wet feet, but the practice has great disadvantages, and is only a choice of evils. The ill effects of rubber coverings for the feet may be much reduced by being

scrupulously careful to wear them only while walking or using active exercise, and taking them off as soon as we sit down or enter the house. Water-proof boots and shoes have no special advantages over rubber over-shoes, and labor under the very great disadvantage that they are much less apt to be taken off as soon as the urgent necessity for their use ceases.

The evil results from wet feet may often be diminished, or entirely averted, by taking off the damp shoes and stockings, rubbing the feet dry, toasting them before a hot fire, or hot blast of air from a furnace, and putting on dry, well warmed stockings and shoes as thick, or thicker, than those laid aside. To be effectual, however, this programme must be gone through with *at once*, without waiting to become rested enough, after fatigue, to make the additional exertion easy; even a delay of five minutes may be sufficient to annul all benefits from such a drying process, and permit the occurrence of congestion of some internal organ, which will lead to serious or fatal illness.

Poisonous clothing, although less common than some sensational alarmists would represent, does come to market; and some years ago I had at the Pennsylvania Hospital a severe case of poisoning of a man's neck and face from a crimson neck-handkerchief dyed with aniline. Gloves, stockings, drawers, etc., colored with aniline, red, blue, or other tints, should be carefully avoided by children and ladies with sensitive skins.

CHAPTER VI.

PURE AIR, AND HOW TO BREATHE IT.

THE importance of a sufficient supply of pure air to our well-being, and even to our actual existence, can scarcely be overestimated; and it is probable that a large majority of the diseases which cut off generation after generation of our race, assail their victims through impure, unwholesome, or poisoned air. Almost every one has heard of the celebrated Grotto del Cane, near Naples, where emanations of carbonic acid gas, from the floor of the cave, so poison the air that dogs, because they breathe a stratum of air only a few inches above the surface of the ground, fall insensible soon after their entrance, and would die in a few minutes, if not removed to a purer atmosphere. The valley of the Upas tree in Java, about which such frightful accounts are given,—if there is any foundation at all for this traveller's story,—probably owes whatever deadly influence it does possess to some such evolution of carbonic acid in its depths which contaminates its atmosphere.

Perhaps one of the most instructive lessons against

the overcrowding of human beings in a confined space is that furnished by the horrible sufferings of 146 prisoners shut up, on a sultry night in August, in the well known Black Hole of Calcutta. The tortures endured by these poor creatures from heat, thirst, and gradual suffocation, were so intense, that at six o'clock the next morning, when the doors were opened, only 23 came out alive — 123, or nearly six-sevenths of the entire number, having perished in agony for want of air.

Air, I need scarcely remind my readers, is a compound of oxygen, the life-giving principle of nature, and nitrogen, an inert gas, apparently added merely to dilute the more active and stimulating ingredient. In pure air, the nitrogen forms by bulk nearly seventy-nine per cent., and the oxygen twenty-one per cent., but as ordinarily found, there are besides from three to six parts in the ten thousand (.03 to .06 of one per cent.) of carbonic acid, with traces of watery vapor and of ammonia.

In ill-ventilated places inhabited by men or animals, the proportion of oxygen may be reduced to twenty, or even to nineteen per cent., and the amount of carbonic acid increased to .1, .15, or even .2 per cent. Such alterations in the constitution of the air are not only deleterious and dangerous, if carried too far, but have been proved by direct experiment to be even in minor degrees very prejudicial to health,

causing great loss of vital force, and strongly predisposing to attacks of disease.

But how are such changes in the atmosphere produced by overcrowding? To answer this question, it will be necessary to glance for a moment at the physiology of respiration, and its relations to the circulation of the blood.

By the action of the heart, which is a hollow muscular bag, contracting in a healthy man about seventy times per minute, about sixteen hundred pints of venous blood are pumped into the fine capillary (or hair-like) blood-vessels of the lungs every hour. These sixteen hundred pints of blood, by being spread out in the fine net-work of delicate tubes in the walls of the air-cells, get rid of nearly sixty pints of carbonic acid, and absorb rather more than sixty pints of oxygen in that space of time. Our very life immediately depends upon this gaining of fresh oxygen and getting rid of stale carbonic acid unceasingly, for, as is shown in hanging and drowning, let this process be forcibly interrupted even for a few minutes, and death is the result. Night and day, while life continues, our hearts must go on pumping dark purple venous blood into the lungs, to be there purified and changed into red arterial blood by losing its carbonic acid and gaining fresh oxygen, which is carried to every part of our bodies, conveying to them new and vigorous life. Night and day, too, must the

lungs, in their turn, pump in fresh air (about seventeen times per minute in health) to furnish this necessary supply of revivifying oxygen ; and, what is almost equally important, they must pump out the air which has been partly deprived of its oxygen, and has received in its place the worn-out and now deleterious substances got rid of by venous blood, among wnich the carbonic acid, such as poisons the air of the Neapolitan grotto, is among the chief.

Since, then, air which has been breathed has lost some of its life-giving power, and has, besides, become contaminated with useless and injurious refuse materials, it is obvious that we had better avoid taking it again into our lungs, even were it as pleasant as fresh portions of the atmosphere. How much more, then, must every refined and cleanly person shrink from inhaling into the very recesses of his or her body air which is loaded with the foul emanations and worn-out refuse cast off at every breath by the filthy, perhaps diseased, people who push their way into most crowded places, and especially into the ill-ventilated halls, lecture-rooms, theatres, etc., of our large towns and cities? If it were anything else but air, the idea of using it thus at second-hand, after its ejection by dirty and unwholesome persons, would be horribly disgusting, but because these impurities of air are invisible to the naked eye, they are drawn into the lungs of refined gentlemen and delicate ladies

without a thought of their degraded nature and origin, or of their poisonous power.

The proof that carbonic acid is given off by the lungs and rejected in once breathed air is very simple, and can be obtained in a few minutes by any one of my readers. This test only requires a small glass tube, eight or ten inches long, and half a pint of lime-water, easily made by shaking a lump of lime the size of a walnut in a quart or so of hydrant-water. All you have to do is to dip the end of the tube to the bottom of the bottle of lime-water, and then breathe out the air from your lungs for half a minute through the pipe, so that it will bubble up through the water. The clear fluid will very soon become cloudy, almost milky, from the formation of carbonate of lime by the union of the carbonic acid expired from your lungs with the lime which the water has dissolved.

The existence of refuse animal matter is not so readily demonstrated, and yet one visit to the steerage of an emigrant ship, the crowded ward of an almshouse, or the overflowing lodging-room of a police-station, will furnish powerful evidence that a hundred persons breathing the air of a moderately large room soon render it foul and unwholesome. Of course, exactly the impurities with which this hundred poison the atmosphere in half an hour, would be given off from the lungs of ten persons in five hours, or by a single individual in about two days' time.

The principle of our experiment for showing the presence of carbonic acid in air as it is breathed out of our lungs has been very ingeniously applied to testing the amount of this impurity. It is called Dr. Angus Smith's household test for carbonic acid, and is applied as follows: Procure a bottle holding 10½ fluidounces, fill it with the air of the room you wish to examine, by blowing it in with a bellows or sucking it in through a glass tube pushed down to the bottom of the vial; pour in half an ounce of lime-water, and, after corking tightly, shake well for two or three minutes. If, after a short time, there is no milky appearance of the lime-water, you may know to a certainty that the 10 ounces of air in the bottle do not contain enough carbonic acid to form a visible precipitate of carbonate of lime (chalk) in the lime-water, and this has been proved by careful experiment on a large scale to be equal to less than $\frac{6}{100}$ of one per cent. of carbonic acid in the sample of air tested; a quantity which has been agreed upon by some high sanitary authorities as the limit beyond which the accumulation of this impurity (and others, perhaps much more noxious, which seem to always accompany it when it arises from human or animal respiration) is injurious to health, and should not be permitted to occur.

Although this carbonic acid and its vile companions given off from the lungs of man and beast are

some of the most common impurities, there are many other deleterious ingredients, both gaseous and solid, which woefully vitiate the atmosphere when they gain access to it. Among these, some of the most important are the effluvia from drains, sewers, and cess-pits, which have often proved most dangerous causes of disease. In one instance, out of twenty-two boys at a school near Clapham, England, who watched the opening and cleaning of a drain which had become choked up, twenty were siezed within three hours with violent vomiting, diarrhœa, prostration, and fever, and two of these twenty died from the effects of the poison they inhaled into their lungs whilst standing over the drain. There is little doubt, as I shall point out more fully in the next chapter when speaking of sewerage, that the effluvia with which sewer-gas is loaded, escaping through stationary wash-stands, bath-tub waste-pipes, and water-closets, is a fruitful source, perhaps, indeed, the great source, of typhoid fever, diphtheria, and scarlet-fever epidemics in the cities and chief towns of our country.

Effluvia from decomposing animal matter often contaminate the air to such an extent as to give rise to pestilential disorders. The carcasses of men and horses upon battle-fields bring on epidemics of diarrhœa or dysentery, etc., and the vapors given out from thickly crowded graveyards greatly increase the sick- and death-rates of neighborhoods in which they are disseminated.

The emanations from manure factories, brick-fields, and chemical works of various kinds, are more or less deleterious to health, and the air of marshes or low-lying meadows is very apt to give rise to remittent or intermittent fevers, bilious fever, ague, etc.

Dust in the air, in regard to which Prof. Tyndall has done such good service to humanity by pointing out its connection with disease, is composed of an infinite variety of materials, among which the microscope reveals innumerable epithelial scales from the skins of men and animals, hairs, fragments of wool, cotton, and flax fibres, pollen grains, splinters of wood, bark, shreds of leaves, particles of coal, soot, sand, earth, and many other articles too numerous or too disgusting to mention. Some of these irritate the lungs mechanically, as, for example, is the case with the angular fragments of anthracite or bituminous coal, which cause a peculiar form of lung-disease called miner's consumption. This affection cuts short the days of an immense number of those who work in coal-dust, and after death their lungs are found to be filled with sharp particles of coal, which, being inhaled with the breath, become embedded in the substance of the lung, and there, acting as so many little splinters in the flesh, give rise to innumerable minute boils or abscesses by which the breathing apparatus is actually riddled with holes, and so much of it destroyed, that the poor sufferers

die for want of lung enough to properly supply their blood with air.

The fine particles of steel thrown off in grinding saws and other tools give rise to "saw-grinder's consumption," the dust from the clay in potteries to "potter's asthma," and the fragments of wool, flax, etc., in cloth factories, cotton mills, and so forth, to bronchitis, and other lung complaints. All these contaminations of pure air seem to have a merely mechanical effect; but such impurities as phosphorus in match factories, lead in white-lead works, copper and brass in foundries, where the latter give rise to "brass-founder's ague," and especially arsenic from the green wall-papers, chintzes, etc., now so much in vogue, and which should never be used, have a chemical and poisonous influence which it is worth a great deal of pains to avoid.

Most of the victims to these various kinds of dust in the air are really sufferers through ignorance of their injurious or fatal effects; but, now that I have pointed out the danger, I trust none of my readers will allow themselves to be exposed to such deleterious influences, at any rate without using every precaution which science has devised to diminish the evil results.

The great remedy for impurities of air is, of course, ventilation, and the best method of accomplishing this has been for many years one of the great objects

of sanitarians. It is obvious, however, at the outset, that the air of an inhabited room cannot, even if we try our best, be kept as pure as the external atmosphere, so that the object of ventilation must be only to reduce the impurities of respiration to such an extent that breathing them into our lungs again will not be manifestly detrimental to health. I have already mentioned that six one-hundredths of one per cent. of carbonic acid is all that we should allow the air of our dwelling-houses to contain, and in order to keep the ratio of the carbonic acid and its associated animal impurities down to this limit, it has been found, by experiment, that it is necessary to supply three thousand cubic feet of perfectly pure air each hour for every adult man who is vitiating the atmosphere of a room by breathing it. This amount of air would fill a chamber ten feet wide, ten feet high, and thirty feet long; so that if we remember that every man in a crowded theatre, for example, ought to have three such roomfuls furnished to him during an ordinary three hours' performance, we begin to realize what an important consideration is the due ventilation of halls for public assemblages, and why so many sensitive persons, especially ladies, feel oppressed, suffer from violent headache, etc., or even actually faint away toward the close of a lecture or performance before a crowded house. In such cases, too, the gas-lights or other sources of illumination

(except the electric and oxy-hydrogen lights) aid very much in rendering the air impure, since it has been calculated that one gas-burner, consuming three cubic feet of gas, produces about as much carbonic acid as would the breathing apparatus of ten men in the same length of time.

The difficulty of changing the air of an apartment often enough to maintain the standard of purity from respiratory contamination is very much increased by the necessity we are under of so arranging the flow of air that the inhabitants of the room shall not be subjected to draughts, and this desirable object can only be attained by having the number of cubic feet of space allotted to each individual comparatively great. It has been proved by further direct observation, that with the best ventilating appliances, and if the air is properly warmed, we may change the air of a room containing four hundred and twenty-four cubic feet (a chamber of about six feet wide, seven feet long, and ten feet high) six times in an hour without creating appreciable draughts. With natural ventilation, however, that is, ventilation from the cracks of doors and windows, it is almost impossible to replace the air of a chamber more than three times in an hour without exposing the inmates to unpleasant currents of air; and, therefore, in order to supply the amount I have just declared to be requisite, without causing injurious draughts, persons should not con-

gregate in a room to a greater number than one to every one thousand cubic feet, and this only when the best natural ventilation is secured. According to this rule, an apartment ten feet high, ten feet wide, and twenty feet long, should contain two people; and in a chamber twenty feet square and ten feet high, four persons, *but no more*, might be allowed to sit, eat, or sleep. Of course, these laws of health are constantly outraged by the poor and the ignorant, as well as the parsimonious and the foolhardy; but sooner or later such violations are sure to entail their own punishment, and there is no doubt that much of the dyspepsia, neuralgia, debility, premature old age, etc., so common among persons who spend a large portion of their lives in close, ill-ventilated rooms, is due to the deleterious impurities of second-hand air, which I have so earnestly sought to warn you against admitting into your systems.

CHAPTER VII.

PURE WATER, AND HOW TO OBTAIN IT.

WATER is the second great material necessary for human existence, the first being air, the subject of our preceding chapter, since it is estimated that man can live without air from two to ten minutes only; without water for three, four, or five days; without sleep for seven days, and without food for ten or fifteen days.

But if water is thus an absolute requisite for life, pure water is a no less imperative necessity for health, and since this fluid is especially apt to become contaminated, as a result of its nearly universal solvent powers, it behooves us to watch with exceeding care the sources of our supply.

Water constitutes about three-fourths of the surface of the earth, and the greater part of the bodies of man and other animals; some vegetables, such as celery and cabbage, may contain as much as ninety-five per cent. of it. A healthy individual requires from three to five pints of water daily, nearly one-third of this quantity being contained in articles of

diet, and the rest supplied to the system in the form of liquids.

Rain-water being the condensed vapor which is constantly given off from the surface of seas, lakes, and rivers, and therefore the product of a natural distillation, is the purest of all forms ordinarily met with, if collected as it falls in clean vessels. Practically, if it is obtained from clean slate or galvanized iron roofs, and preserved in suitable cisterns, it is the best water for our use, but very often impurities from the surfaces upon which it descends, impurities from the pipes through which it flows (such as lead), and impurities of storage from foul cisterns, etc., render it less suitable for drinking and cooking purposes than properly selected well-water.

Some hundred years ago, a curious epidemic, characterized by pain in the stomach and bowels, obstinate constipation, and, later on in the attack, symptoms of palsy, broke out in the city of Amsterdam, for a time baffling the skill of the ablest physicians, until at last it was discovered to be lead-poisoning, due to the substitution of lead for tile roofs, from which the drinking-water was collected. The new-fashioned metallic roofs were soon abandoned, and the epidemic promptly disappeared.

Rivers are probably the most usual sources of supply for our drinking-waters, and if due care is exercised to prevent contamination of the liquid from

sewers, factories, etc., along the banks of the streams, this variety of water is one of the least objectionable.

A certain amount of saline impurity, especially of the sulphates and chlorides of the alkaline earths, must be present in order to render river-water safe from contamination by lead pipes, if these are used for distributing the fluid, as they are in most of our larger cities and towns. The way in which these soluble salts act is not by directly preventing the water from dissolving the lead, but by forming with the metal an insoluble coating over the inner surface of the pipe, which mechanically precludes the water from having any action upon the metallic surface. It is on account of the very purity of rain-water from these saline compounds, that lead pipes or lead-lined cisterns should never be used for its conveyance or retention, and many cases of obscure and dangerous illness in country houses have of late years been traced to neglect of this precaution against the entrance of a potent cause of disease into our system.

Much might be written to advantage in regard to the impurities of river-water, but I am compelled, by want of space, to hasten on to the subject of well-water, the contaminations of which cause a large proportion of the acute disorders affecting inhabitants of the rural districts.

When rain falls upon the surface of the ground, a portion of the moisture runs off into brooks, creeks,

and rivers, but a much larger part soaks downwards through the earth, and after a few hours or days finds its way by the minute holes in the soil into our wells. In the course of its journey towards the centre of the earth, it dissolves, as already intimated, numerous mineral ingredients, which may render it unpalatable, or even to some degree unwholesome, although seldom actually noxious to health. It is far different, however, with materials which it meets with in its way, derived from the animal kingdom, since these often change our drinking-water into slow and insidious poison, or into swift agents of sudden destruction. Two of the most fatal scourges of humanity — cholera and typhoid fever — are particularly apt to be transmitted from one victim to another by way of contaminated well-water.

I can probably impress this most important fact upon the minds of my readers more forcibly by means of a couple of anecdotes than in any other way; and if the lessons these two true stories teach, were constantly borne in mind, and acted upon throughout the community, thousands of valuable lives would, I doubt not, annually be saved.

The famous tea-water pump in Broad Street, near Golden Square, London, is believed to have been the means of killing five hundred persons with cholera, in a single week, during the epidemic of 1854, and its agency in disseminating this fearful scourge was

detected in the following curious way: It has long been known that water which contains five or six grains of lime, or magnesia, to the gallon, is much the best for making tea, because this amount of the mineral ingredients mentioned prevents the solution of certain astringent principles of the leaf. Thus, the Broad Street pump became known, and highly appreciated, because it furnished water impregnated with exactly the right quantity of lime to make "the cup which cheers, but does not inebriate," in its full perfection; and when the cholera broke out in its neighborhood, people, who removed to other quarters of London, continued to send to this pump to procure their tea-water. One old lady in particular, who took refuge in the distant suburb of Hampstead, sent her maid-servant every day three miles for a kettle of water, to the Broad Street pump, and this old lady and her maid were the only persons attacked with cholera in Hampstead. The attention of health officers was finally attracted to the pump as a disseminator of disease, and after taking away the pump-handle the pestilence notably decreased in the neighborhood. The water of this pump well was afterwards proved to have become contaminated by the soakage into it of discharges from the bowels of cholera patients using cess-pits in its vicinity, such discharges being now known to form the chief agents in propagating this terrible disease.

Prof. Flint relates a remarkable instance in which it was possible to trace the spread of an outbreak of typhoid fever, which is often so fatal in the country, in the most conclusive manner to the poisoning of a well by discharges from the bowels of a patient ill with the disease. A young man travelling by stage-coach through the State of Vermont was taken ill, and, when he could go no further, was left at the tavern of small wayside village to be cared for, his illness soon proving to be typhoid fever. Now, it happened that a small brook in a shallow valley divided the village into two portions, each consisting of about half a dozen houses. In the course of a few days, new cases of typhoid fever made their appearance in that half of the village to which the tavern belonged, and soon every house on that side of the stream *except one* was invaded, whilst on the other side of the brook not a case occurred. It appears that the tavern well, which was the only one which had been dug on that bank of the stream, furnished the water-supply to all the families *but one* belonging there. *That one family* had had a falling out with the landlord of the inn, and in consequence of this quarrel they drank none of the water, which was rendered impure by the soaking into it of the specific poison of typhoid fever, which struck down all of their neighbors in that half of the town.

Recent observations upon the propagation and

spread of diphtheria tend to show that in all those instances of excessive malignity, when whole families of children have been swept away in a few weeks, careful examination will reveal the cause of this unusual mortality in a water-supply contaminated by washings or soakings from cess-pits or other receptacles for the evacuations of the bowels of more or less diseased human beings. Direct experiment has proved that in a light porous soil a well eighty feet deep will drain a mass of soil in the shape of an inverted cone, the apex of which is at the bottom of the well, and the base of which has a diameter of two hundred feet, or more than twice the depth of the well. Hence, if, in the centre of a large village building lot one hundred and fifty feet square, is dug the well for supplying the mansion with water, and at any one of its corners, as far distant as possible, is sunk a more or less shallow pit to serve as a cess-pool, the chance of contaminating the first pit with rain-water washings from the second pit or cess-pool is very great, and the danger of infecting the whole family with cholera, typhoid fever (and probably some other maladies), should a single case of these diseases find access to the grounds, imminent. Of course, the same conclusion holds good for country farmhouses or dwellings, when, from motives of convenience, but a short distance is interposed between the sides of the hole which is called the well, and

furnishes the drinking-water, and the hole which is called a cess-pit and used as a receptacle for filthy, often poisonous excrement. Moreover, there are, no doubt, many instances where, owing to the inclination of beds of sand or gravel, strata of rock, and so forth, impurities of these and other dangerous varieties may be carried by underground currents much further than the distances as measured on the surface of the earth which I have mentioned. In other words, a cess-pool on a hillside two hundred feet or more away from a well may infect the water of the latter, if underground currents favor such contamination. Practically, it is beyond all question that, in multitudes of instances, the cess-pits *feed the wells;* and it is equally certain that such wells *feed the graveyards* of villages and districts where this culpable neglect of hygienic precautions is allowed to occur. In this connection, I cannot too strongly impress upon my readers that filtration through the earth, sufficient to remove visible impurities, does not necessarily render water fit for use, that is to say, *clear* water is not necessarily *pure* water any more than *cold* air is necessarily *pure* air.

Water from small creeks, ponds, mill-dams, marshes, etc., is very apt to be impure, not having even the uncertain benefit of filtration through the earth to strain out the germs of various diseases. Many attacks of ague, bilious fever, and typhoid fever can be

traced to drinking such water, and the eggs or young of sundry parasitic worms, and so forth, probably often gain an entrance into the stomach, and from thence to other parts of the system in this way.

One of the simplest and cheapest pieces of apparatus for purifying water is Dr. Parkes' cottage filter, which is thus prepared. "Get a common earthenware flower-pot, and cover the hole with a bit of zinc wire gauze, or of clean washed flannel, which requires changing from time to time; then put into the pot about three inches of gravel, and above that the same depth of white sand washed very clean. Four inches of animal charcoal (covered with a thin stratum of coarse gravel, or with a piece of slate to keep it in place) constitute the last layer; and the water should be poured in on the top and be received from the hole at the bottom into a large glass bottle. The charcoal will, from time to time, become clogged, and must then be cleaned by heating over the fire in a shovel. The sand or gravel should also be cleaned or renewed from time to time."

A convenient test for decomposing animal matter in water is the development of a putrid odor by standing twenty-four hours in a perfectly clean, well-scalded bottle. A pint-bottle, two-thirds full and tightly corked, may be used, and if any disagreeable smell is discoverable, the fluid should be carefully tested by a competent chemist before being employed for cook-

ing or drinking purposes. Of course, a water may be very impure, and yet yield no foul odor when thus examined.

A wise precaution when travelling in unhealthy districts, or during the prevalence of an epidemic, is to drink none but boiled rain-water. To be effectual, the boiling should be continued briskly for half an hour or longer. Rain-water is preferable in many regions, because the hard water (containing lime) is but partially or not at all improved by boiling, and gives rise to serious diarrhœa in many of those unaccustomed to its employment, also, probably, to calculous disorders.

The question of how to get rid of waste and filthy water, constituting part of the very important subject of drainage, can only be briefly touched upon here. The sewers, which in most cities and large towns are supposed to carry off the superfluous liquids or "slops" of all kinds, frequently become imperfect; and the foul fluids — liquid poisons, as they have been most appropriately entitled — stand still in hollow places or soak through bad joints, and contaminate the drinking-water or the air upon which we are so utterly dependent.

Make it a rule, therefore, neither to sleep nor eat in a house where the drains are not in perfect order, and do not trust to the absence of a bad smell as sufficient evidence that no poisonous effluvia are escaping

from sewers, or any of the connecting pipes by which waste water finds its outlet. Above all, reject stationary wash-stands in bed-rooms, or bath-rooms and other "modern conveniences," adjoining sleeping or living rooms. Such modern conveniences are in reality conveniences for the ready entrance of typhoid fever, diphtheria, and other dangerous diseases into your dwellings, and all the ordinary forms of "traps" and ventilators, no matter how well they are kept in order, mechanically, seemed to have proved powerless to prevent the admission of these terrible maladies.

It is to be hoped that some sanitary Edison will soon devise effectual methods of sewerage, but until then, beware of the emanation from foul water in sewers, drains, etc., as you would of the poison of yellow fever or of small-pox, which, indeed, it may readily contain.

CHAPTER VIII.

BATHS, AND HOW TO TAKE THEM.

IT is related of the celebrated, but eccentric, Dr. Abernethy, that upon one occasion a child was brought to him suffering from some disease of the skin, it is true, but in a far worse condition from want of cleanliness. The Doctor, seeing at once that this latter misfortune was the cause of the former, said to the boy's mother, "I can soon cure your son, if you will strictly follow my directions. Get a large tub, fill it every day two-thirds full of warm water, put the little fellow into it, and then rub him all over with the best Castile soap, and a coarse towel." "But, Doctor," exclaimed the astonished woman, "that would be giving my child a bath." "True," replied the physician, "it is open to that objection."

If, as I firmly believe, it is morally our duty to take the best possible care of the bodies with which we have been intrusted, the old saying, that "cleanliness is akin to godliness," finds no higher expression than in the proper use of baths.

The employment of baths goes back to the highest

antiquity, and was indulged in almost to excess by the Greeks and Romans. So important are baths in warm countries, that the Jewish and oriental religions enjoin frequent ablutions as a necessary part of the ceremonials of their creeds, thus no doubt largely contributing to the health and well-being of their devout disciples.

In order to understand the value of bathing, we must glance for a few moments at the anatomy and the physiology of the skin, which is, of course, the portion of our bodies chiefly interested in the process. In the first place, we have on the entire outer surface of the body a layer of membrane, like thin leather, called the epidermis; this stratum is not supplied with nerves, is therefore insensible, and constitutes the portion which rises up when the hands are blistered by rowing, for example, or when a fly-blister is applied. It is through it that pins are run in the common school-boy's trick of arming the fingers with their points. Just beneath the epidermis lies the true skin or corium, as it is called, a tough, strong membrane, richly supplied with blood-vessels and nerves. Hence it bleeds and feels pain at the slightest cut or puncture, since even the finest needle cannot be thrust into it without wounding some little artery or vein, and some tiny filament of nerve. Under the true skin again lies the subcutaneous cellular tissue, which generally contains a good deal of fat.

The most important constituents of the skin to our present inquiry, however, are: 1st. The sweat-glands; 2d. The oil-glands; and, 3d. The hair and nails usually spoken of as appendages to the skin.

The sweat-glands are twisted and coiled up tubes, occupying the true skin and the layer of tissue beneath. They open upon the outside of the epidermis by an immense number of minute openings called *pores*, almost invisible to the naked eye. It is estimated that there are on an average nearly 3,000 pores (each the mouth of a sweat-gland) to every square inch of the skin upon a human body, and that the total length of the hair-like tubes, forming the glands all over the surface of an ordinary sized man, is about twenty-eight miles. The effect of stopping twenty-eight miles of sewer-pipes, as those drainage tubes of our systems may be denominated, can readily be imagined, and has been experimentally shown upon dogs by the cruel and quickly fatal process of varnishing them over after cutting off all the hair. But even in very filthy people, the coating of dirt, oily matter, from the oil-glands of the skin, saline materials from the perspiration, and epithelial scales from the epidermis, is never so dense as a coat of varnish, so that perspiration goes on through it, although much less efficiently than when the body is kept clean.

When we are at rest, the flow of perspiration, though constant, is seldom so free that it does not evaporate

almost as rapidly as it exudes, so that the skin is only kept pleasantly moist; but during exercise, especially in warm weather, the cutaneous surface becomes covered with drops of fluid. The evaporation of liquid from the skin has an important influence in retaining the body at its proper temperature of 98.4° Fahrenheit, and also in separating any excess of water which may have been taken into the stomach from the blood, into which fluids we drink are quickly absorbed. Of course, when the pores of the skin are partly choked up, so that they cannot do their work properly, some of this duty of purifying and regulating the volume of the blood is thrown upon certain internal organs, such as the kidneys or intestines; and should these happen to be weak, diseased, or already overtasked, serious disturbance may be quickly brought on throughout the whole system.

Now, these two agencies, namely, first, the local irritation of the skin by dirt, worn-out epithelial scales, dried perspiration, and exuded oily matter; and, second, the general derangement of health due to unwholesome blood, which is not purified as it should be, give rise to most of the troublesome and disgusting skin diseases which are not the results of contagion or due to animal and vegetable parasites. Hence, the man or woman who will take the simple and delightful precaution of bathing often enough to keep the cutaneous surface in a good condition, may

be almost sure of escaping a large class of skin diseases.*

Having thus demonstrated, I trust, to my reader's full satisfaction, the inestimable value of frequent ablution of the skin, let us now consider the varieties of baths.

For purposes of cleanliness, the baths par excellence are those of warm water, this term being applied to the ones in which water of a temperature from 70° to 80° is employed. Liquids of this degree of heat usually give a sensation of warmth when placed in contact with the human skin, and therefore avoid the disadvantages of the shock to our systems produced by a cold bath (that is, below 60°), and the excessive stimulation resulting from a hot bath, *i. e.*, one of 85° and upwards. Soap, or alkali in some form, is necessary to remove the fatty matter poured out by the oil-glands already described, and for most people there is nothing better than the old-fashioned white Castile. Many persons are apt to remain too long in a warm bath, and care should be taken to avoid this mistake, which has a very debilitating effect if often indulged in.

The frequency with which a bath should be repeated varies somewhat with different individuals.

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* The remainder being almost equally avoidable, as will be pointed out in Chap. XV.

Some there are whose skins exude a large amount of strong-smelling materials, for whom a bath twice daily, in warm weather, is almost a necessity; whilst others, whose skins are less active as common sewers for the impurities of the system, need only a daily or tri-weekly ablution. There is no doubt that bathing, like all other good things, may be carried to injurious excess, and I have often seen patients seriously impair their health by too frequent resort to the bath-tub. At the same time it is equally certain that by far the majority err in the opposite direction, and, as the records of hospitals for skin diseases testify, fail to yield sufficient obedience to the command, "wash, and be clean." A safe rule, to which there are of course sundry exceptions, would be to bathe the whole body twice a week in winter and every other day in summer, gradually increasing this frequency to a tri-weekly washing in winter and a daily one in summer, if experience proves that better health is secured by such a habit.

It is very important to avoid being exposed to cool air after immersion in a warm bath, because mechanical obstructions to the outflow of perspiration from the pores being washed away, the amount of fluid poured out upon the skin, and consequently the cooling effect of evaporation from the cutaneous surface is greater, and the danger of becoming chilled much increased. The condition is accurately expressed by

the popular saying that a warm bath "opens the pores," although the exact mechanism by which this opening is accomplished is not so generally understood. Hence it follows that the best time for bathing, with those who are in robust health, yet are liable to take cold, is in the evening, when they can go to bed at once, and so avoid all exposure for some hours afterwards. Invalids, however, and those who have delicate constitutions, will often find that they endure the exertion of taking a bath best about eleven o'clock in the morning, after digestion of the morning meal is accomplished, and yet before they are tired out with the fatigues of the day.

Hot baths, by which are meant those of a temperature of from 85° to 105° Fahrenheit, are chiefly used in the treatment of diseases as powerful stimulants, and scarcely require notice here. Every parent should remember, however, that a hot bath, causing free perspiration, promoted by wrapping up warm in bed with blankets, will often save children and adults severe attacks of illness, if promptly resorted to after exposure to cold or wet.

Cold baths are invaluable aids in promoting and preserving health, if properly used in suitable cases, but may become dangerous agents, causing even fatal results, if employed by the wrong individuals, at improper times, or with excessive frequency. Very cold plunge-baths, that is those below 50° in temper-

ature, should only be indulged in by the most robust, and even with them it is doubtful whether the shock to the system is not more injurious than the after reaction is beneficial. In every instance, the test for the advantage of a cold bath is very simple and easily understood, being merely the occurrence or non-occurrence of this reaction or "glow" as soon as the skin is dried; when such a glow is felt promptly, the bath does good, and may be repeated at the same or a slightly lower temperature; but if reaction takes place slowly, or not at all, the person feeling chilly, and the lips, the skin beneath the nails, and, indeed, that of the external surface generally, continuing for ten or twenty minutes bluish instead of pink, the bath does harm.

Cool (not ice-cold) sponge baths are valuable tonics, and may often be advantageously used in delicate states of health. The shock to the system is much less than with the plunge-bath, and the consequent reaction less intense, but the rule for judging of their beneficial influence is precisely the same.

Sea-bathing is one of our best means of strengthening the system, either to prevent the development of actual disease, or to restore the original vigor to a constitution recovering with difficulty from the effects of some debilitating malady. No doubt much of the supposed advantage of sea-bathing is often due to the sea-air, and the other influences—mental, phys-

ical, and social which belong to the various watering-places upon the coast; but this combination of favorable conditions is so invaluable, especially with children, that I have often seen a single day's excursion to the sea-side produce a marked and obvious improvement in those whose general health had for any reason fallen below their normal standard of vigor. Unfortunately, many of the sea-side resorts are supplied with impure water, often contaminated with sewage from the cess-pools, which send their disgusting contents soaking through the loose sandy soil for hundreds of feet, poisoning the drinking-water of wells and cisterns, and spreading the germs of diarrhœa, typhoid fever, diphtheria, etc., to such an extent that, if they are not guarded against, even the benefits of sea-air and sea-bathing are more than counterbalanced (see p. 77). For the many delicate ladies and children who are not strong enough to endure the shock of cold sea-baths in the surf, bathing in warm salt water, as now supplied at the chief sea-side watering-places, is invaluable.

Baths should never be taken immediately after a meal, nor when the body is very much exhausted by fatigue or excitement of any kind, nor during nor just before menstruation; and they should be sparingly and guardedly used by pregnant women.

Children and elderly persons ought to employ warm or but slightly cool baths, never below 70° Fahren-

heit. In persons of nervous temperament, and the subjects of valvular disease of the heart, cold baths should be very cautiously resorted to, but in robust adults of sanguine or bilious temperament, they may be indulged in with much greater freedom.

As a brief appendix to this chapter upon the toilet, the subject of poisonous hair dyes is too important to be entirely omitted. Many of these, which it is claimed contain no mineral ingredient, depend for their efficiency upon some salt of lead, and as this deleterious metal is absorbed into the system through the skin, when frequently applied, as it is when employed to color the hair, there is no doubt that it often gives rise to dangerous or even fatal results. Cases of paralysis, apparently due to this cause, have been reported; and it is probable that Bright's disease may occasionally owe its origin to the long-continued indulgence in hair dyes and face powders containing lead.

CHAPTER IX.

THE HOUSE, AND HOW TO BUILD IT.

NO treatise upon the means of attaining long life could be at all complete without some reference to that cause of so many evils — our habitations.

Of course, some of my readers will be prevented by circumstances from selecting the kind of a domicile which would be most conducive to health, but even those whose choice is of the narrowest can avoid certain grave dangers originating in unwholesome habitations, if the vital importance of doing so is clearly pointed out to them.

In our chapters upon pure air and pure water much has been said respecting the importance of obtaining these two great hygienic conditions, and, in selecting a house, especial care must be exercised against the presence of soil, situation, or construction which will interfere with these factors of health. In city houses, where river-water is supplied by means of iron pipes, the great danger is from foul air penetrating into the dwelling by means of sewer-pipes, or

finding its way through the earth from adjacent sewers, underlying cess-pits, or from decomposing animal and vegetable matters in the soil, if the house is built upon "made ground." In country homesteads, however, on the other hand, the air is generally pure, and the great danger is from contamination of the water-supply by soakage of excrementitious matter from cess-pits, barn-yards, etc., into cisterns or wells. This mode of production of typhoid fever, diarrhœa, diphtheria, and other fatal maladies, has only of late years been understood, and is even yet denied by many intelligent persons, including, I am sorry to say, some members of my own profession who ought to know better. But I think any one who will take the trouble to investigate the condition of the water-supply, in a few instances, where several cases of typhoid, for example, have occurred in a single family in the rural districts, will become promptly convinced that it is only too common and fatal.

In building a house, then (or, in selecting a house which is already erected), choose its site so that the well shall be, if possible, at a higher level than the cess-pit, and as far from it as can be conveniently arranged, taking care, of course, that in avoiding your own cess-pit you do not dig your well so as to drain the offal from your neighbor's property, and so fall into the very error which you seek to avoid. The house wells should never be sunk within a dis-

tance of twice its own depth from any cess-pool or other accumulation of filth. (See p. 76.)

Even the smallest and poorest houses ought to have a cellar which is well ventilated and kept free from moisture as far as possible. Dampness promotes the growth of fungi (moulds, etc.), and, whether in this way or in some other, is a powerful agent in propagating disease. Extensive experience with diphtheria in a rural district leads me to confirm the statement that the breeding-grounds of diphtheria in the country are generally well recognized places, where it is constantly liable to break out anew, and the constant condition of these localities is structural dampness of the houses.

In more pretentious mansions, furnaces and soil-pipes are two of the most dangerous enemies of health. The furnace should be so constructed as to have no communication between its warm air-chamber and the cellar in which it is built, all the air being supplied by a wooden box conveying it fresh from the outside atmosphere. Unless this is attended to, the heat of the furnace causes it to act as a powerful sucker for the impure air in the ground beneath the house and that in the soil for scores of feet around. Caution in this respect is particularly important in city houses, because the air in the soil, or ground air, as the celebrated Prof. von Pettenkofer calls it, is frequently very much contaminated by soakage from

old privies, leakage from gas- and sewer-pipes, as well as the outflow from defective sewer-mains.

The sewer-pipes are exceedingly apt to leak at the joints if made from terra cotta, as is so often the case; and they are also liable to be broken by the settling of walls, sand or gravel beds, etc. Even if these accidents are escaped, the material of the pipe is by no means impervious; and, in fact, the only safe drain-pipes for noxious materials of this kind are those made of iron, securely united by leaden joints, and so laid as to be protected from undue pressure. These, too, should be regularly inspected, as rusting sometimes goes on with unusual rapidity.

Cisterns require special care and watchfulness, as there is no doubt that a multitude of deaths are due to neglect of very simple rules in regard to them. In the first place, when used for rain-water or any very pure spring-water, they should never be made of lead or lined with this metal, because the freer the water is from saline impurities, the more certain it is to act on the lead, and, by dissolving it, become poisonous. The proper material is slate; but brick or stone, lined with cement, or, in some cases, galvanized iron, may be employed. Under no circumstances should the overflow-pipe communicate with a drain which serves to convey away refuse fluid from sinks, water-closets, etc. The cistern should be supplied with a tightly-fitting cover to exclude dust and dirt as far as possible,

but this cover should be arranged so that it may readily be removed to allow inspection of the interior. Such inspection should be rigidly made at short intervals, as rats, mice, or other vermin seek out and penetrate into cisterns in search of water, and being apt to drown in it, often cause serious illness by the decomposition of their bodies in the fluid drunk by the household. No water intended for family use should be preserved in a cistern occupying the same room as a water-closet, nor should it be brought to the reservoir from the roofs, or from a spring, in leaden pipes. The same caution in regard to leaden service-pipes is important.

When, for any reason, water kept in cisterns of doubtful purity has to be used temporarily, the danger of its causing disease may be much diminished, as already suggested, by boiling every drop for half an hour shortly before it is drunk, and also by filtering through animal charcoal. (See Chap. VII., p. 78.) Remember, always, that if cholera, cholera-infantum, typhoid fever, diarrhœa, or dysentery, appear in your family without obvious cause, *the chances are at least two to one that there is something wrong with the water supply, the milk supply, or the drainage of your house.*

The bedrooms of a dwelling should be large, airy, and ventilated with special care; those for children should be quite distinct from the day-nurseries, and

during the day ought to stand with windows and doors wide open from the time they are vacated in the morning until an hour before sunset, except in the coldest weather. Day-nurseries should be provided with plenty of light and plenty of air, well warmed and well moistened before it enters the apartment. This latter desideratum is satisfactorily accomplished by means of the porous evaporators now coming into use for placing before the register admitting heated air. The immediate removal of soiled linen and all liquid or solid excreta must be strictly enforced. No diapers should ever be dried in the nursery before the register. All these precautions are particularly important with children, because their lungs, stomachs, etc., are much more susceptible to the disturbing causes of disease than are those of adults.

For information in regard to most of the sanitary details respecting the house and its immediate neighborhood, I must refer my readers to a future volume of these Health Primers especially devoted to this subject; but there is one point in regard to the decoration of a house so gravely important, that it deserves brief mention here. This is in regard to the paper-hanging. It has been proved by direct analysis that many of the dark-green papers now so much in vogue contain large quantities of arsenic, in some instances to the extent of twenty-nine grains to the square foot. This poisonous mineral, being of course

rubbed off little by little in fine particles, mingles with the air of the room, and indeed of the entire house, giving rise to the usual symptoms of arsenical poisoning, which, however, may readily escape reference to their true cause (just as the Devonshire colic was for many years attributed to some unknown influence, until it was discovered to be due to the lead taken up from lead-lined tanks, etc., in which the Devonshire farmers fermented their cider).

The indications of health being disturbed by poisoning from arsenical wall-paper are obstinate headache, nausea, sickness at the stomach, and diarrhœa; but when the quantity of the poison is small, obscure nervous symptoms may for a time alone be present.

Every new house or newly-plastered house should be allowed ample time to dry before it is occupied, and attacks of sickness by the million have arisen from ignorance of this fact. Von Pettenkofer, whom I have so often quoted as the greatest living sanitarian, calculates that the walls of a house containing one hundred thousand bricks also contain ten thousand gallons of water when first completed, and he wisely insists that nearly all this fluid should evaporate before human beings are permitted to inhabit the dwelling.

CHAPTER X.

FOOD, AND HOW TO DIGEST IT.

NOTHING is more important to our physical well-being, and consequently to the attainment of long life, than the two evidences of a healthy stomach, which the immortal dramatist has linked together in that oft-quoted saying of Macbeth's,

> "Let good digestion wait on appetite,
> And health on both."

The serio-comic answer to a recent English essayist's inquiry whether, after all, this life is worth living? viz., "That depends upon the *liver*," owes most of its truth to the fact that derangements of the stomach, constituting dyspepsia and its kindred evils of digestion, are the fruitful sources of hepatic disorder.

If we consider the amount of ill-temper, despondency, and general unhappiness which arises from want of proper digestion and assimilation of our food, it seems obviously well worth while to put forth every effort, and undergo any sacrifice, for the purpose of avoiding indigestion, with its resulting bodily ills; and yet, year after year, from the cradle to the grave, we all go on violating the plainest and simplest laws of

health, at the temptation of cooks, caterers, and confectioners, whose share in shortening the average term of human life is probably nearly equal to that of the combined armies and navies of the world.

Although, as I have already remarked, food comes after air, water, and sleep, as an indispensable condition of human existence, this is only because a two weeks' supply of nutriment can often be stored up in the body in the form of fat; and but for this provision of nature, apparently to meet the uncertainties of the chase in savage life, it is probable that mankind must have become extinct by starvation long before the granaries and storehouses of civilized existence were invented to guard against such a catastrophe.

We might just as well look for a locomotive to run without plenty of wood and water, as expect a human body to perform its daily labor, or even to carry on the muscular exertion necessary to propel the blood through its arteries and veins, or inspire the proper amount of air into the lungs, without a due supply of suitable food, properly chewed, swallowed, digested, assimilated, and carried by the blood to nourish the various organs and tissues of the system, as they hourly wear out and are replaced in the service of the body.

Perhaps I need scarcely more than remind my readers that every part of our organisms is the subject of continual change. The flesh of your arm to-day is not precisely the same flesh as yesterday; some of its molecules have become used up, dissolved, and

carried away by the blood, and have been cast out of the system through the kidneys or bowels, whilst their places have been supplied by new molecules formed in that wonderful physiological laboratory, the blood, from the food you have taken into your stomach. If, now, the stomach or the blood do not do their work properly, or if, doing the best they can, they are not supplied with suitable materials in the food you furnish them, the effete molecules of your arm are not fully replaced, and your muscles become flabby and dwindle away; or, on the other hand, if, by unusually nutritious food and the stimulus of exercise, a greater number of new muscle molecules are elaborated in the blood than are carried away by it in a worn-out condition, growth and development of your arm is the result. And so on with all the different portions of the body.

The overpowering desire with which nature inspires animals in a wild state for the necessary constituents of their organisms, is well shown at the salt licks of our various States, to which deer and other animals resort for hundreds of miles, and in spite of all the dangers which beset them, because they *must* have salt in their blood. Again, any one who has watched the ravenous avidity with which laying hens will swallow fragments of egg-shells, would wonder at their apparent insanity, if they did not remember that hens *must* have lime in their blood, to furnish from it the solid coverings of their new-laid eggs.

We know well that whole groups of diseases, such as scurvy, for example, are caused by the continued deprivation of some simple article of food; and it is highly probable that other common maladies are due to similar, but at present unrecognized, deficiencies of our diet in some particular chemical element, perhaps only needed in fractions of a grain. Again, on the other hand, the entrance of extremely minute amounts of certain substances into our food or drink, as, for example, lead or arsenic, will gradually undermine health, and even destroy life, if long continued.

Another very important office of food, especially the fatty or highly carbonized articles of our diet, is that of supplying the bodily heat by being slowly burnt up within our systems, exactly as the coal (mineral carbon) burnt up in furnaces warms our dwellings, except that the process of combustion is so managed in us that it goes on slowly, and only a very little at a time, with the result of giving out no light and but a moderate amount of heat.

The materials which make up our food besides water and saline ingredients are, 1st. The nitrogenous (such as meat, eggs, cheese, the gluten of wheat flour, animal jellies, etc.); 2d. The fatty (such as fat of animals, butter, olive oil, and so forth); and 3d. The saccharine, comprising starch, sugar, and molasses in all their varieties (bread, potatoes, rice, etc., for example).

The office of the first of these groups is to supply

the waste of muscular substance caused by pulsation of the heart, breathing, eating, etc., and by physical exercise, such as manual labor, walking, or riding. Fatty articles of diet are chiefly employed in the animal economy to sustain the heat of the body by their gradual combustion, and the third group of saccharine elements contribute to the same end, although they accomplish this object with much less efficiency.

Much time and trouble have been expended by sanitarians in the effort to determine the proper amount and proportions of the different articles of food necessary to keep an average human being in health. The results of these observations, arranged into diet tables, are very briefly somewhat as follows: A healthy, full-grown American, doing a moderate amount of work, requires daily about four and one-half ounces of dry nitrogenous, three ounces of fatty, and fifteen ounces of sugary and starchy food, besides an ounce of saline matter. That is to say, in order to retain his full strength and weight, he must eat *and thoroughly digest* every twenty-four hours rather more than a pound of fresh meat and eggs, about two pounds each of bread and potatoes, or their equivalents in other starchy and saccharine foods, with nearly a quarter of a pound of butter, lard, and suet.

Under ordinary circumstances, the penalty for taking less than this amount of food is loss of flesh and strength, more or less rapid in proportion to the degree in which economy of nutriment, forced or other-

wise, is practised. The penalty for eating more than these quantities is derangement of the stomach, liver, and intestines by overloading them, and a consequent production of dyspepsia, biliousness, diarrhœa, or constipation, with their innumerable attendant evils, which more, perhaps, than any other class of influences, prevent the attainment of long life.

But the conditions under which we live are constantly varying, and of necessity the amount and character of our aliment must be altered to compensate, as far as possible, for these modified surroundings. This power to adapt himself to circumstances is one of the most important distinctions between civilized man and savages or brute beasts, and is nowhere more distinctly exhibited than in regard to food.

The amount of exercise taken or labor performed is one of the most important of these modifying conditions, an adult man in idleness needing about one-fourth less, and a farmer at hard labor requiring nearly one-fourth more, than the quantities mentioned. The influence of climate is also considerable; inhabitants of cold regions requiring more fatty nutriment, as do the Esquimaux, whilst those who reside in the torrid zone instinctively partake less freely of both fatty and nitrogenous articles of diet. As a rule, women need about nine-tenths of the nourishment requisite for men, boys of sixteen about the same as women, and children of ten years half the amount necessary for adults. Individual peculiarities, whether tempo-

rary or permanent, should be studied and conformed to with the utmost care.

The quantity of food taken into the stomach at different meals is a matter of great moment. Speaking generally, the morning meal should comprise one-third of the meat and two-sevenths of the starchy nutriment; dinner should include the remaining two-thirds of the meat and three-sevenths of the starchy materials; and the evening repast consist of the last two-sevenths of the saccharine and starchy matters. By this plan the fatty constituents would be equally divided among the three meals, but this may be varied according to taste. In average health, the amount of food taken into the stomach might safely be left to the control of the appetite, were it not for the machinations of cooks, who contrive to delude and entrap our natural guide in this vitally important affair into all sorts of immoderate excesses. An excellent rule is always to leave the table with an appetite for good wholesome food, such as roast beef, or bread and butter, without any of the tempting delicacies which too often betray quite as cruelly as did the contents of the Trojan horse in ancient story.

Whilst there are some individuals who, at least in the prime of their lives, are endowed with such ostrich-like stomachs that they can eat immense quantities of unwholesome food with impunity, most adults, and nearly all children and old people, must either be careful of their diet or be soundly chastised

by Nature for their neglect. It is therefore very important to discover what articles we should avoid.

Certain varieties of food generally prove injurious, certain others disagreeable only when people who partake of them are not in perfect health, and others still alone cause disturbance in the systems of a few peculiarly constituted individuals. This last class must learn what Nature commands them to do without by practical experience, and these articles of diet, "when found, they should make a note on," and religiously avoid.

The mode of cooking food is a subject of great importance, and will probably be considered at length in a future volume of this series. At present, I will merely suggest that boiled meats, etc., are most digestible, but least nutritious; roast and broiled dishes are well suited to good digestions; whilst the process of frying is so injurious, that reason and revelation may well unite in attributing its invention to the arch-enemy of mankind.

Among the devices of cooks which are very apt to prove causes of disease, may be enumerated lobster salad, fried oysters, boiled crabs, rich pastry, boiled dough in the form of plum puddings, dumplings, etc., boiled corn beef, hard-boiled eggs, pork in most of its forms, cucumbers, however prepared, excessively sweet dishes, and rich gravies in general. People who are not iron-clad inside and out, and who will trifle with their health and life by lighting fires with

kerosene, playing with loaded fire-arms, or eating these so-called "delicacies," should at least have their wills made, and all their property judiciously disposed of.

Much of our exact knowledge respecting the digestibility of various aliments, is derived from observations upon a Canadian, named Alexis St. Martin, who had a hole shot through his side into his stomach, which healed at the edges without closing up entirely, so that the process of digestion could be watched in all its stages without difficulty. A few of the results thus obtained are as follows: Boiled rice was digested in one hour; whipped eggs or plain raw eggs were digested in one and a half hours. Lamb, baked potatoes, and fricasseed chicken were digested in from two to two and three-quarter hours; soft-boiled eggs, oysters, roast beef, and bread and butter, in about three hours; hard-boiled eggs in three and one-half hours; and salt beef or pork in four and one-quarter hours. Much depends, however, upon the condition of the body in various ways, as, for instance, in regard to exercise, curiously shown by Sir John Hunter's famous experiment of feeding two dogs equally, and taking one out to run after a hare, whilst the other was allowed to lie down and sleep. At the end of an hour both were killed, when the food in the first dog's stomach was found almost unaltered, but that in the second dog was nearly digested, and most of it had passed out into the bowels. From this experiment, we may *dogmatically* assert

that active exertion is not favorable to digestion, and that therefore no violent exercise should be taken after a full meal; and *vice versâ*.

The dining-room should be the warmest room in the house, and it should also be well ventilated; mental anxiety or labor, as well as bodily exertion, should be avoided just before, during, and for half an hour after a full repast. Lighter meals may be advantageously followed by gentle exercise, such as walking or moderate work. Violations of these rules are not, of course, in every case promptly punished, but the mills of the goddess Hygeia, like those of the rest of the Olympian brotherhood, "grind slowly, but they grind exceeding small," and if in this case the *grist* is the usual one of dyspepsia, it were far better for the victim that he had never been born.

With rare exceptions, people can never enjoy good health whilst they suffer from constipation, a vice much more prevalent than is generally known or believed. Liver complaint, dyspepsia, headache, vertigo, and that tormenting disease, piles, are only some of the direct results of constipation, and give rise to an immense amount of human misery. I have no doubt that learning to have an evacuation of the bowels regularly every morning conduces far more to a man's health, happiness, and success in life than a complete classical education, invaluable as that certainly is; and when the habit is once established, nothing, *absolutely nothing*, should be permitted to interrupt

it. Of course, we ought all to strive to overcome constipation by laxative articles of diet, such as bran bread, fruit, fresh or dried, and by suitable exercise; but if these fail, the employment of gentle saline purgatives, such as Saratoga and Friedrichshall water, or of rhubarb, and the use of injections, constitutes by far the lesser evil.

The accessory foods, under which title are grouped tea, coffee, cocoa, and alcoholic stimulants, are those articles of diet which, whilst they furnish some small amount of nourishment, are chiefly valuable as economizing the wear and tear of the body, or in exciting it to a temporary excess of activity in order to meet some unusual emergency. For a large majority of the human family, the first three of these accessories are useful, probably promoting both comfort and enjoyment to a marked degree; and yet a small minority are certainly better off without them, as are also most children, and certainly all infants. No rule can be given for determining beforehand whether any individual belongs to the fortunate multitude or the unfortunate handful in this respect, and cautious experiment with small quantities, gradually increased to moderate ones, is the only guide which can be relied upon. All I can advise in this and other dietetic investigations is, that you accept the result of one, two, or at most three fair trials as final and conclusive. The arguments for and against the use of alcohol (brandy, whiskey, wine, ale, beer, etc.) are too

extended to be rehearsed here. Personally, I have no doubt that the evils of intemperance far exceed the benefits of a moderate use of alcohol, and I can fully appreciate and admire the philanthropy of that devout Brahmin who, it is said, recently undertook to convert the benighted Christian world to Buddhism in order to save it from the beastly vice of habitual intoxication. To those who will and still can take counsel, I would say, never swallow a drop of alcohol in any form except upon the written prescription of a reputable physician.

Tobacco is purely a luxury (although habit may render it, like other poisons, a necessity, such as De Quincy found opium), and it has no claims to a place among articles of diet, since it contributes nothing physically to the well-being of the body. By its sedative and calming effect upon the mind and nervous system generally it is no doubt sometimes useful, but most people are better off without it, and to a considerable number it proves positively and quickly injurious. If the principle upon which a burnt child dreads the fire ever becomes generally applicable to boys and young men who smoke one or two strong cigars as a first experiment, tobacco manufacture will be a much less lucrative occupation than it is at the present time.

Complete mastication of the food is so vitally important to health and long life, that I cannot avoid

saying a few words in regard to the care of the teeth, although their proper conservation in detail will form the subject of a separate volume of our Health Primers.

Unless the teeth are carefully cleaned (by brushing, for instance, with water and pure Castile soap) after each meal, they are apt to become more or less covered, near their junction with the gum, with the yellow, green, or brown deposit of "tartar," which, besides being very disgusting, is thought by some to cause deterioration of the enamel or of the dentine.

The disgusting odor which proceeds from the fairest mouth if furnished with decayed teeth, the agonizing pain of toothache, and the facial deformity which ensues upon the extraction of those teeth, which all the wonderful skill of the dental practitioner sometimes fails to save, are minor evils compared with the injury to health which results from a loss of the natural apparatus for masticating the food.

Care should be taken to avoid brushing the teeth too much, especially with detergent dentifrices, and thus injuring the gums or wearing away the very enamel which it is our object to preserve. Never break hard bodies with the teeth, nor use them as nut-crackers, scissors, pincers, monkey-wrenches, and other carpenter's tools. Hot and cold liquids, especially in quick succession, should not, as in drinking, be brought in contact with them; and acid medicines, strong vinegar, syrups, and sweetmeats, should likewise be kept away from the teeth.

CHAPTER XI.

IMPURITIES OF FOOD AND DRINK, AND HOW TO DETECT THEM.

WHEN we consider that a healthy man of usual size takes into his stomach every year, on an average, about four hundred pounds of meat, five hundred pounds of bread, three hundred pounds of potatoes and vegetables, ninety pounds of butter and fats, and one hundred and fifty gallons of tea, coffee, water, or other fluids, we can soon realize how dangerous the existence of impurities, or adulterations of even a few grains in the pound, must be to us all, and how absolutely necessary to the attainment of long life and the enjoyment of health, is a due recognition and avoidance of articles of diet which contain such noxious ingredients.

Be it observed, too, that whether food be thus contaminated through fraudulent design, or through ignorant carelessness, makes no atom of difference in its effect upon the person who eats it, since, in accordance with the inexorable laws of dietetics, Nature here pays no regard to the intention of an action, and

punishes *errors of diet*, committed through benevolent ignorance, just as heavily (perhaps even with the penalty of death) as if they were the result of the most malicious crime.

Many of the ingenious falsifications of foods and drinks can only be detected with certainty, of course, by a complete microscopical and chemical analysis, which, in England, and a few of our States, is provided for, as it should be everywhere by the appointment of skilful chemists and microscopists under government authority, whose duty it is to examine suspected articles offered for sale in the markets and shops. A few of the adulterations can, however, be easily recognized, whilst others can be detected by simple and inexpensive apparatus, without any great technical knowledge, and these I propose in this chapter briefly to explain.

Flour is sometimes largely adulterated with finely ground rice, potatoes, peas, beans, barley, and oats, but these impurities, which can readily be detected by microscopical examination, only diminish its nutritive value; a more serious adulteration is that with alum, which serves to whiten the bread made from it, and so enables dishonest bakers to sell the product of poor or damaged flour at a high price. On the continent of Europe sulphate of copper (blue vitriol) is sometimes employed for the same purpose. The presence of alum in bread, flour, or baking-powder,

may be readily detected by the deep purple color produced on soaking it in a weak solution of extract of logwood, which may be purchased for a few cents at any drug store. In former times, whole provinces in Europe were ravaged by epidemics, of what is called ergotism, a peculiar disease, in which the fingers and toes drop off, caused by living upon rye flour, containing the ergot or smut of rye; but at present this mode of poisoning is rarely met with. Occasionally, painters, plumbers, and other workers in lead, suffer from lead poisoning, and paper-hangers, etc., from arsenical poisoning, in consequence of their eating bread and other articles of food with fingers which have not been properly cleansed from metallic particles adhering to them. The Mosaic injunction against "eating with unwashed hands" would, if universally carried out, obviate this danger; and, indeed, many of the edicts of the ancient Hebrew lawgiver have a scientific sanitary basis, which, considering the state of human civilization at the epoch when they were issued, nearly four thousand years ago, seems to point unmistakably to their origin in a wisdom from on high.

Butter is rarely adulterated with injurious impurities, although the purified animal fats honestly sold under the names of butterine, oleo-margarine, etc., are no doubt often mixed with the inferior grades of butter. These contaminations, however repulsive

and disgusting to refined palates, are not as a rule likely to shorten life.

Milk, on the contrary, is very frequently the subject of dangerous adulteration, and in view of the fact that it constitutes the staff of life for most of our children during a large part of their infancy, and at a time when their hold upon life is of the frailest character, it becomes a most important question how such fraud can be absolutely prevented. The true successors of King Herod in our day are the milkmen, who slay the children "of two years old and under" by thousands with swill milk, adulterated milk, and milk loaded with the poisonous germs of scarlet-fever, typhoid fever, or various other diseases; and, as I have elsewhere remarked, it seems to me only needful for the danger of this mode of propagation of disease to be forcibly presented, and fairly understood, to ensure that the people, through their legislators, would put an end to the abominable traffic in impure milk, which costs the lives of so many thousands of their beloved children annually. Swill milk, and milk from stall-fed cattle, which are generally diseased, and often consumptive, has been proved to be very unwholesome, and in the light of recent developments in regard to the innoculability and communicability of consumption, scrofula, and other tubercular diseases, should be absolutely avoided, as a probable cause of these terrible maladies, from which,

in some temperate climates, nearly one-third of the earth's inhabitants perish. In England, numerous wide-spread epidemics of scarlet-fever and typhoid fever have been unmistakably traced to the milk supply, which was contaminated with the germs of these complaints. In one instance, case after case of typhoid broke out among the customers of a certain milkman, and when at last an investigation was held, this person admitted that his milk cans had been "*washed out*" with water from a certain well which was proved to be infected by sewage from a neighboring cess-pit containing typhoid-fever excrement.

The use of milk diluted with water, however, as it is commonly supplied in cities, has no injurious effect if the "iron-tailed cow" is a healthy one, except that its nutritive properties are, of course, lessened. This sophistication can sometimes be detected by the lactometer, or milk hydrometer, an instrument for determining the specific gravity of the milk, which is, of course, reduced if water only is added; but artful dairymen frequently bring up the specific gravity to the proper standard by dissolving salt or sugar in the diluted milk, so that this test cannot be implicitly relied upon. Many infantile disorders are probably caused by giving children milk which has begun to sour a little in consequence of the growth in it of a minute fungus which develops very rapidly in warm rooms or during warm weather. This danger, as

well as the disadvantage of using an article too much diluted, may be avoided by employing condensed milk, which is a great convenience whilst travelling. Care should be taken always to boil the water shortly before it is mixed with the condensed milk, in order to destroy, if possible, any organic germs of disease which it may contain ; and when its use is continued for any considerable length of time, the chance of lead poisoning from the solder of the tin cans in which it is put up for market must not be overlooked. Such an unfortunate result would probably occur only in a child who was unusually susceptible to the action of the metal, and its first symptoms are generally colicky pains in the abdomen and obstinate constipation of the bowels.

A committee of Boston physicians reported some years since that over a million and a half gallons of water were sold *as milk* in their city that year, nearly $500,000 being paid for it by the defrauded customers. They further point out that this water was probably not even pure, but apt to be taken, when thus used to adulterate milk, from impure streams and barnyard wells, and hence to produce typhoid fever and other infectious diseases in those who drank it. One instance is noted where, in twenty different families, thirty-four cases of typhoid fever were caused by drinking milk thus adulterated with water from a well sunk near a cess-pit. They declare the high death-

rate among city infants from cholera-infantum is largely attributable to poisoned and weakened milk.

Meat of various kinds can scarcely be said to undergo adulteration, although the presence in it of trichina and the larva of tape-worm are fruitful sources of disease, which will be treated of in a subsequent chapter. (See Chap. XV.) The ordinary danger from meat, and especially from fish, is that which arises from commencing putrefaction, and to detect this the sense of smell is usually a sufficient guide. In cases of doubt, cut a small portion of the suspected flesh into small pieces, and pour over it a few ounces of hot water, with the vapor of which a disagreeable odor will rise if any be present.

Good *eggs* may be recognized by putting them in a strong brine made with one ounce of common table salt to ten ounces of water. In this a sound egg sinks to the bottom, whilst the stale one will float at the top.

Tea is not unfrequently adulterated with the leaves of other plants, and with those of the true tea shrub, which have been dried after most of their virtues are extracted by infusion in water. Black tea is sometimes colored with "black lead," which, as it contains no lead and consists almost entirely of pure carbon or charcoal, is quite harmless. Green tea, however, often owes its glaze or bloom to a mixture of Prussian blue, indigo and China clay, which, if not

poisonous, is at least indigestible, and quite inappropriate as an article of food.

Coffee is chiefly adulterated with chicory, burnt peas or beans, acorns, saw-dust, etc.; these frauds may, of course, always be avoided by purchasing the coffee berries unground, either roasted or in their green state.

In regard to the condiments, it is sufficient for me to mention that Cayenne pepper has been found largely adulterated with the dangerous impurity of red lead, and vinegar is often manufactured from oil of vitriol, diluted freely with water, and flavored with a little genuine cider or wine vinegar to give it the proper odor. Fraudulent vinegar of this kind, if used for a long time, would be apt to bring on diarrhœa, dysentery, and ulceration of the bowels. It may be detected by the absence or scarcity of the minute vinegar eels when examined microscopically, or even with a magnifying-glass, and by its giving an abundant white precipitate when a few drops of solution of barium chloride are added to a suspected sample.

Occasional examples of serious or even fatal poisoning from partaking of stale fish, oysters, crabs, etc., and of sausages which have been long on hand, render it advisable to reject all articles of food of this kind, unless we have every reason to believe they are fresh and in good condition.

The subject of "Proposed Legislation on the Adulteration of Food and Medicine" is ably discussed in a recent monograph with this title, by my friend, Prof. E. R. Squibb, M.D., of Brooklyn, N. Y.; and his sagacious conclusions will, I trust, soon be embodied in the laws of our various States.

Cooking fruit in brass or copper kettles, although now less common than formerly, before its dangers were properly understood, is still sometimes practised, as is also the making of pickles in such metallic vessels for the purpose of giving them a fine green color. This is, of course, due to the beautiful but deadly acetate of copper, or verdigris, formed by the action of vinegar upon copper or brass. Preserved green peas have sometimes been found to owe their fine fresh color to a salt of copper, and should then be eaten with caution, *or* not at all.

The acids of preserved fruits generally are liable to act upon the lead of the solder joining the tin cans in which they are put up, and thus give rise to lead colic in people who partake of such delicacies.

CHAPTER XII.

EXERCISE, AND HOW TO TAKE IT.

EXERCISE, in the strict signification of the word, means the performance of its function by any and every organ of the body; as, for instance, exercise of the stomach is digestion, and exercise of the liver is the formation of bile. As usually employed, however, it signifies the action of the voluntary muscles, that is, those under the control of the will; and in this sense it will be used here. Since not only the circulation of the blood, but also the formation of its elements, and the destruction of these elements when worn out and useless, are powerfully, and, as a rule, favorably, influenced by this action of the voluntary muscles, it is obvious that without such movement health will almost inevitably be impaired or lost.

The most important effect of exercise is to be seen in the lungs when the circulation of the blood is hurried much above the ordinary rate. As a consequence of this greater influx of blood to be aerated, or rather oxygenated, in the air-cells, the quantity of air inspired, and the amount of carbonic acid exhaled, are both largely increased. From the experi-

ments of some physiologists, it would appear that the unusual amount of carbonic acid given off from the lungs during exercise is really formed in the muscles which are actively employed, and *must* be speedily carried away from them, dissolved in the blood, to the air-cells of the lungs, whence it finds its exit from the body. If this is not accomplished with sufficient rapidity, the muscular substance soon becomes oppressed with the poisonous carbonic acid, and so debilitated as to grow almost powerless, as we often find to be the case when workmen are compelled to make violent muscular exertion in a confined space cut off from the free access of the atmosphere.

If either the supply of carbon to the muscles, or its elimination from them through the blood to the lungs, and from thence into the open air, is interfered with in any way whatever, capacity for exertion of the muscles in question is quickly lost. Hence, during exertion no clothing should be worn which interferes with the free play of the chest; a larger amount of carbon should be furnished in the nourishment, and experiment has shown that this is more efficient if supplied in the form of fatty than of starchy food. Furthermore, since alcohol has a tendency to lessen the quantity of carbonic acid given off by the lungs, it should not be used in the shape of brandy, whiskey, or wine, during exercise.

Muscular exertion very speedily increases the force

and frequency of the heart's pulsations, and the amount of blood flowing through all parts of the body, including the heart itself, in a given time is much augmented. The number of beats of the heart may be altered from about seventy, which is the natural rate, up to ninety, one hundred, or even one hundred and twenty to the minute. After the cessation of exercise, however, the beats fall below the usual number, and if the exertion has been very severe or long-continued, may descend as low as forty per minute, and become intermittent.

Going up a steep hill, or even a long staircase, gives rise to a very severe strain upon a fatigued heart, and is especially apt to bring on cardiac disease, although this is liable to result from any excessive exertion. Under such circumstances, actual rupture or bursting of the heart has been known to occur, the individual literally dying, in such instances, of that malady so rare in real life, but so terribly fatal to the heroes and heroines of novelists, "a broken heart." Very commonly, however, palpitation, enlargement, or disease of the valves of the heart are brought on by excessive exercise, especially in ascending heights.

On the other hand, deficiency of exercise is apt to lead to weakening of the heart's action, probably from its dilatation, or swelling up, while its substance grows thinner, or from a change (which is frequently observed in fact) of the muscular structure into fat (fatty degeneration).

A stern warning against omitting to exercise all the faculties (mental and physical) with which we are endowed is furnished by the fate of the crabs in the Mammoth Cave. Similar crabs outside the Cave are supplied with very keen eyes, at the end of movable stalks, which afford them a wonderful range of vision; but the Cave crabs are punished for neglecting to use their sight by complete loss of the eyes, although the stalks which, generations ago, no doubt, carried the optical apparatus, still remain in position upon their heads.

Severe muscular exertion increases the flow of blood in the small blood-vessels of the skin, and causes a profuse discharge of perspiration, which may be even doubled or trebled in amount. During active exercise, there is little danger of chill, but immediately afterwards, and also during the intervals of rest, the skin should be so warmly protected as to prevent the least feeling of coolness of the surface. For this purpose, flannel is by far the best covering.

Moderate exercise causes the muscles employed to increase in size, become harder, and respond more readily to the commands of the will; but if the exertion is too prolonged or excessive, the opposite effect is produced, and they begin to soften and waste. This fact gives us the foundation of a simple rule for determining when the physical strength is overtaxed by any habitual labor or athletic sport.

The circumstance that the ancient athletes, as the runners, gladiators, etc., in Greek or Roman games,

were called, had the name of being proverbially stupid, is often urged as an evidence that unusual physical cultivation interferes with, or even prevents, high mental activity, probably because the nervous fluid or influence is partially withdrawn from the brain to the severely taxed muscles. There is, I have no doubt, a good deal of truth in this notion, especially as it is amply demonstrated that deficient exercise causes a heightened sensitiveness of the nervous system, generally a sort of morbid excitability, and a greater susceptibility to the action of external influences of every kind.

Inclination for food is largely increased by exercise, especially the disposition to eat meat, and fatty articles of food in general. On the other hand, deficient exercise leads to the avoidance of meat and of fats, with partial neglect of even starchy and saccharine diet.

But, my reader may ask, what is the amount of exercise a healthy man should take every day, in order to promote and sustain the most perfect sanitary condition of his body? And this question is the more important, because there is no doubt that great errors in this respect are constantly committed by whole classes of persons, chiefly in the direction of deficiency of exercise.

According to the late Prof. Parkes, our eminent English authority upon sanitary science, we may consider that, in the most healthy life of a vigorous man engaged in active labor in the open air, a full day's work

will probably be equivalent to lifting three hundred tons one foot high, or what is, of course, the same thing, equal to raising one ton to the height of three hundred feet. This, however, is a hard day's work; and, therefore, as an approximation, we may estimate that the daily amount of exercise for every man in good health ought to be equal to half this much, that is, to lifting a hundred and fifty tons to the height of one foot. It has been calculated that for an individual weighing one hundred and fifty pounds, this amount of muscular exertion would be about equal to that put forth in walking eight and a half miles upon level ground. If, now, we suppose that the expenditure of force in going up stairs, and moving round the house, is equivalent to a two-and-a-half mile walk, this would reduce our allowance of open-air walking to six miles every day, a distance which is by no means too great to be paced over by every vigorous man who wishes to attain long life, and enjoy good health up to old age.

For females of average strength, a smaller amount of pedestrian exercise, amounting to three or four miles daily, would generally be appropriate, although the brilliant complexions, robust health, and perennial youth of English ladies are no doubt largely due to their habits of constant and, it would seem to most Americans, excessive out-door exertion; many British women having no hesitation in starting off for a

ten-mile walk, of an afternoon, without any important object except the benefit of exercise.

In the great English Universities of Oxford and Cambridge, it has been proved by centuries of experience that, as a rule, the most indefatigable scholars make better progress in their studies, if they take two hours out of their fourteen or sixteen working-hours for constitutional exercise in rowing, walking, or cricket, than if they attempt to perform mental work continuously, without allotting a proper period to mere bodily exertion.

As I have already remarked, the quantity of carbonic acid given off bears a nearly constant relation to the amount of muscular labor performed, and in this we have a valuable guide to the relative usefulness, as promoters of health, possessed by different kinds of exercise. If we consider that the amount of air inspired, and therefore required by the body to carry off the carbonic acid formed, whilst lying down be considered as the standard, and called 1, we may show, by direct experiment, that standing up in the erect position raises the quantity of inspired air to 1.33; walking at the slow pace of one mile an hour nearly doubles it; walking at the rate of four miles an hour renders five times as much air requisite to carry off the carbonic acid; and riding on horseback necessitates the breathing of about four times as much.

Although I earnestly recommend an increased amount of out-door exercise as a most important aid

towards the restoration and maintenance of health, I would caution my readers against too great or too sudden alteration of their habits in this respect. Moreover, no greater mistake, from a hygienic point of view, can be made than in increasing the amount of physical exercise, when the mind is overworked, without a corresponding reduction of mental labor, and *vice versâ*. Very often it is only by resting the brain more at the same time that the muscles are exerted longer and to a greater extent, that the required balance of action in the system is brought about, and health is restored or retained.

The amount of exercise in childhood and youth should be most carefully regulated, as, in many instances, ambitious children will far exceed their strength in the effort to avoid being outdone by older or more robust companions. In infancy, the almost incessant movements of a baby's limbs show how imperative is the instinct of Nature for muscular exercise. A baby seems to rejoice in putting in action every muscle of its body, and often the sole cause of its uneasiness appears to be disappointment over its inability to solve, with its arms, legs, and head, all at once, the problem of perpetual motion. Hence it is important not to restrict too much the movements of infants, and care should be taken to prevent their clothing being too tight to allow ample freedom of the limbs. Even the cry of a young child is often useful as a means of exercising the muscles of the

chest, and, in moderation, must not be discouraged. After the baby begins to walk, the amount of this kind of exercise which it is stimulated to indulge in must be guided for a year or two by the extent of ossification (or bony development) of the leg-bones, otherwise these may become bent by the weight of the infant, and permanently deformed.

During childhood and youth effort should be made to exercise every important muscle in the body, each in its turn, so as to secure for all a complete and symmetrical development, and consequently a robust health. To accomplish this the light gymnastics, with dumb-bells, rings, etc., for girls, and the sports of the play-ground, with rowing, swimming, running, leaping, and riding, for boys and young men, are vitally necessary.

The mistake which sadly diminishes the benefit of gymnastics for girls is, that they are generally performed in a close room, or, at best, one wherein the windows are opened for a few minutes only; and statistics show that persons who sit still in the open air, such as apple-women, enjoy better health, as a class, than those who take plenty of exercise in the house. By some additional trouble and expense, this drawback could usually be avoided, as I trust will soon be the case in all well-conducted schools.

Bodily exercise, as well as mental exertion, should be regulated with especial care in young girls about the epoch of puberty, since the changes of the constitution at that momentous period often render or-

dinary rules and habits useless or even injurious. In cases of doubt, medical advice should always be summoned in order to avoid laying the foundation of life-long imperfections of development as a consequence of temporary overstudy or overwork. The same caution is applicable in regard to boys, although to a less extent.

Where systematic gymnastics do not form part of the exercise indulged in, attention should be paid to the varieties of muscular exertion, in order that, even during adult life, all the different parts of the body should receive a share of the benefit. In leaping, walking, and running, the muscles of the legs and back are chiefly brought into play, and those of the arms and shoulders have but little occupation, whilst in rowing, boxing, and fencing much of the work is performed by the muscles of the upper half of the body. In swimming, riding, and climbing, the contractile effort is more equally distributed among all the chief muscles of the frame.

In advanced life, the power, as well as the inclination for active exertion, alike fail, and the strongest inducements are sometimes requisite to postpone the period when all exercise is omitted and the individual becomes completely bedridden. This unfortunate condition should be put off as long as possible, and every means employed to encourage the patient not to neglect the regular, even if moderate, exercise of which his reduced physical strength still renders him capable.

CHAPTER XIII.

SLEEP, AND HOW TO SECURE IT.

"GOD bless the man who first invented sleep," exclaims Sancho Panza, and throughout all ages and nations of the world has been echoed his earnest benediction on the author of this invaluable blessing. Well may a recent physiologist declare that the physician who first discovers the true cause of sleep, and how to procure it at will, may count upon receiving the undying gratitude of mankind.

The necessity of repose is felt by every animated being, and manifested not only in the general life of all organisms, but in the partial vitality of each of the senses with which animals are endowed. The sense of taste, for example, no matter how acute it may be at first, becomes, after awhile, blunted by continuous exercise, and its original quickness of perception can only be restored by a period of complete rest from being called upon to notice external objects which have the capacity of arousing it into action. So with sight, hearing, smell, touch, muscular strength, and even mental power, all cease to respond to outside stimulants if too continuously excited, and only regain their susceptibility by rest.

Repose may be either partial or general; when, for example, an accountant, after six or eight hours' mental exertion, leaves his books and takes a brisk walk of at least an hour (as he should do daily, morning and evening), the mind takes a partial repose, whilst the muscles of the legs, which have been resting nearly all day, in their turn are exercised and become fatigued. Every human being, however, has need of periodical intervals of general relaxation, during which neither the intellectual nor the bodily powers are in operation, and this general repose of all the organs and functions of animal life is

"Tired Nature's sweet restorer — balmy sleep."

Night is the most appropriate time for sleep, because, during the silence and calm of the nocturnal hours, repose best restores the lost vigor of the system; those individuals who, for the sake of pleasure and fashion, turn night into day and day into night, do so to the great detriment of their present or future sanitary integrity. Sleep during the daytime is apt to leave a heaviness of the head, a bitter taste in the mouth, and a general feeling of discomfort which continues until evening approaches. Except in very hot countries, the after-dinner nap is an enervating luxury to be carefully avoided by sincere seekers after long life and health, until after middle life is past.

Sleep is intended to repair the expenditure of power in the system consequent upon mental or bodily fatigue, and its duration should therefore be pro-

portioned to the loss of vigor actually met with during the preceding period of daily activity. Hence, the time which should be spent in slumber varies with each individual according to age, temperament, habits, or general health, and to a smaller extent with each day's amount of intellectual or physical labor.

In early infancy, the active processes of growth and development going on in the budding organism require a correspondingly great amount of repair, which is largely contributed to by frequent slumbers, which occupy a majority of the twenty-four hours. The necessity for sleep, which is quite imperative in a young child, becomes gradually less and less pressing until after the age of two or three years is reached, repose during the night only is required. This tendency should by all means be encouraged, because the benefits of sleep during the day are more than counterbalanced by the disadvantages resulting from privation of exercise in the open air and sunshine.

In the prime of manhood or womanhood, the proper period is more readily determined, and is much shorter than that suited to infancy. In advanced life, the expenditure of physical and mental power is smaller, and less need of prolonged repose is felt by the system, although in extreme old age or second childhood the body often reverts to its infantile habits of frequent slumber.

During convalescence from any acute maladies, also, patients should imitate this childish tendency to spend

much of the time in sleep, which is one of our most efficient aids in securing a restoration of bodily vigor impaired by disease. Apart from differences of age, we do not by any means all need the same quantity of sleep, and there are individual differences in this respect for which we cannot account. Others, however, are easily explained, as for example, the fact that nervous, excitable persons need more sleep than robust, unimpressionable people, simply because the events of each day involve a greater wear and tear of the nervous system in the former.

Habit, which so powerfully modifies almost all the bodily functions, exercises a great influence upon the duration of sleep. We must never forget, however, that although we may occasionally succeed in stifling for a time the complaints of the body of want of sleep, we do not thereby prevent that body from suffering the consequences of its deprivation. Those who from necessity (as with night-watchmen) or from choice remain awake through the night, learn to feel, it is true, as soon as the habit is well established, no necessity for nocturnal sleep, and yet the enfeebling of their forces and impoverishment of their blood generally goes on uninterruptedly.

In regard to the influence of temperament, it may be observed that a plethoric habit of body, kept up by full diet, especially of animal food, predisposes to sleep, provided the digestive powers are in vigorous

condition. Persons of this constitution frequently pass nine or ten hours out of the twenty-four in slumber, and assert that they cannot be adequately refreshed by less. On the other hand, thin, wiry people, in whom the nervous temperament predominates, usually require comparatively little sleep, notwithstanding the greater activity of their nervous systems when they are awake, but their slumber, while it lasts, is very deep. Persons of lymphatic temperament, heavy, passionless people, who may be said to live very slowly, are usually great sleepers, but this rather because, through the dulness of the senses, they are less easily kept awake by external impressions of any kind. The amount of sleep is, as already intimated, greatly influenced by habit, and, contrary to what might be anticipated, we find that exceptionally brief sleepers have generally been men of the greatest mental activity. Thus, Frederick the Great, John Hunter (the famous English surgeon), and the first Napoleon, are said to have required only five hours' sleep out of the twenty-four.

Probably no one can sustain a life of vigorous exertion upon a smaller allowance than this, and, as a general rule, from six to eight hours of repose out of every twenty-four are required to keep the system in a state of healthful activity. Of course, as we all know, a few days and nights may generally be passed almost sleeplessly without any serious injury to the health, but prolonged watching, from any cause

whatever, inevitably breaks down the strength, and if further continued will undermine the constitution.

The influence of custom may affect the protraction, as well as the abbreviation of sleep, and the complaining "voice of the sluggard," which we have all been used to hearing in our childish days, drowsily echoes with the call of his tyrannical master — Habit. The state of the brain produced by an excess of sleep is very unfavorable to the exercise of its powers of perception and action. Such a condition may almost be described as a chronic disorder of the nerve centres, and is often the result of natural changes in the direction of decay from old age. The growth of habit and self-indulgence may prematurely bring it on, and this danger, as well as the opposite one of taking too little sleep, must carefully be guarded against.

We must not fall into the error of supposing that the amount of sleep is to be measured by its duration alone, since its intensity is a matter of equal importance. The light doze which is interrupted by the slightest sounds cannot be as renovating as the profound slumber of those whom no ordinary noise will awaken. It appears, moreover, that, independently of any abridgment of proper rest, the sudden, oft-repeated interruption of sleep has a special injurious effect upon the brain. We have not yet been able to determine the exact difference between sleeping and waking, but we do know that the change from the former to the latter ought to be as gradual as on the

approaches of sleep. Usually, when people are abruptly aroused from profound slumber, the action of the heart becomes quickened, or otherwise disturbed, by such interruption, and there is frequently a painful and difficult effort, in recalling the entire consciousness of the waking state, with the same confused mental feelings as are produced by a sudden surprise of great intensity.

The effects of a habitual deficiency of sleep are a sense of wretchedness and prostration, frequently accompanied with great restlessness. These symptoms may be due either to an emotional excitement which keeps slumber from the eyelids, or to a voluntary effort to goad the intellect into continuous activity. Such an event is of very common occurrence in the lives of industrious students and business men, who, with a laudable desire for distinction, allow themselves less than the quantity of repose actually needed by their systems. Headache, fulness, heat, throbbing, and various other unpleasant sensations about the head, give warning that the brain is being overtasked, and should this warning pass unheeded, sleep, which at first it was difficult to resist, becomes even more difficult to obtain — a state of general restlessness and feverish excitement is induced; and if, in spite of this, the effort be continued, serious consequences in the form of brain fever, apoplexy, insanity, and loss of mental power, from softening of the brain, partial or complete, are almost sure to be induced. Such an

effort may be sustained by certain individuals much longer than others, but it is a great mistake to suppose that it is not to them also very injurious. Indeed, being possessed with the delusion that they have constitutions "like a horse," and can endure anything, they frequently prolong the exertion, until a sudden and complete prostration proves what a fearful, often irreparable injury they have been doing to their boasted constitutions.

Having thus considered the subject of sleep, and some of its more common derangements, we come now to that of how to secure repose; many of the contributors to refreshing slumber being, however, already suggested in the early part of this chapter. For example, the fact that sleep is required to repair the lost brain substance and muscular tissue burned up, as it were, in the course of active intellectual and bodily exertion, leads to the obvious deduction that in average health the best cure for sleeplessness is duly regulated exercise of body and mind. So true is this conclusion, that, unless modified by other disturbing causes, the production of healthful sleep in proper amount is an excellent test for the quantity of both kinds of exercise requisite for keeping ourselves in the best possible condition of perfect health, and slight variation in the diverse directions, first of increase and then of decrease, in the amount of physical and mental exertion, will promptly demonstrate,

by their effect in promoting or diminishing slumber, whether our bodies and minds are too much, or too little, fatigued by the course of life hitherto pursued.

Another important condition of healthful repose is the avoidance of eating a full meal shortly before retiring for the night.

Solomon has well said, "The sleep of the laboring man is sweet, whether he eat little or much," and it is true that neither emptiness nor repletion can interfere with the profound and delicious slumber which is gained by long-continued severe physical exertion.

Among the simple and almost hygienic means of promoting sleep, I may mention that, if restlessness seems to be due to congestion and heat about the head, cold water or cold vinegar and water sponged over the forehead and temples will help to relieve it, particularly if other parts of the body are kept warm. The bed-chamber should be well ventilated by having the window open at the top, and the temperature of its atmosphere ought to be kept about 20° or even (for robust persons) 25° below that of ordinary sitting-rooms. An exception, however, is to be noted in regard to all children and to invalids, especially if suffering from diseases of the lungs and throat. Generally, it is better to lie upon an inclined plane, or with the head moderately raised, but not so high as to produce any strain upon the muscles of the neck, for spasmodic or irregular action of these muscles appears to have a singularly disturbing effect upon

the brain. All needless pressure upon the spine ought to be avoided, and hence it is advisable for wakeful persons to lie upon an elastic mattress placed upon a feather bed, which equalizes pressure without subjecting the body to excessive warmth.

Very delicate people often appear to be influenced by the direction as regards the magnetic current in which they lie, the most favorable effects being observed when the head is directed to the north and the feet to the south. Light has an unfavorable influence in preventing sleep, and, therefore, complete darkness should be secured as far as possible; if, from any cause, lights in the bed-chamber are necessary, they should be feeble, and the face of a sleeper carefully shaded from their rays. Whilst loud, abrupt, or unusual sounds of all kinds prevent slumber, it is a curious fact that low, monotonous noises, such as the hum of bees, the distant rippling or falling of water, and the dull voice of a heavy reader, are powerful aids to repose, and may sometimes be employed to overcome restlessness with advantage. Remember, there are few more potent foes to slumber than great anxiety, or excessive effort to procure sleep.

While in attacks of illness the use of alcohol, opium, and chloral often proves of the greatest service, I cannot too strongly warn my readers against their unnecessary employment to secure sleep, as there is good reason to believe is too often done.

CHAPTER XIV.

MENTAL POWER, AND HOW TO RETAIN IT.

AS remarked by the celebrated Dr. Maudsley, we physicians, who have to deal practically with the thoughts, feelings, and conduct of men, and are forced to treat mind not merely as an abstract entity concerning which we may speculate, *but as a force in nature* (just as much as is digestive power or muscular vigor), the operations of which we must patiently observe and learn to develop, influence, and at times restrain, are compelled to recognize how entirely the integrity of the mental function depends upon the bodily organization, and to acknowledge "the essential unity of body and mind."

In the present constitution of society, where the imbecile, the idiotic, and the weak-minded are taken care of through the affection or philanthropy of their stronger children or brethren, failure of intellectual power does not often in itself lead to premature death; and yet such incapacity does so eventuate frequently enough to justify the introduction of a chapter upon mental hygiene into the present Primer, although the

subject will be much more fully treated of in a subsequent volume of the series.

Mental hygiene has been divided in various ways by different authorities, but, as a whole, it includes all that relates to the development, exercise, and maintenance of mental activity in individuals and in communities, and it takes cognizance, therefore, of education, social culture, religion, and national life.

There can be no doubt that mental activity is highly favorable to physical health and development, when systematically regulated and directed into useful channels; but "the irresistible logic of facts" teaches us that, however we may repudiate the dangerous quicksands of materialism, we will have the most success in the development and preservation of intellectual power, if we look upon it for educational and hygienic purposes merely, as a real force capable, like that residing in the muscles, of being strengthened by judicious exercise, temporarily exhausted by fatigue, and debilitated, or even utterly broken down and wrecked, by too prolonged or continuous exertion.

In the training of children, therefore, to secure for them sound minds in sound bodies, we must be equally careful to make brain and muscle alike the recipients of ample nourishment, judicious exercise, and suitable repose.

Duly regulated intellectual labor seems, as a rule, to conduce to longevity, and it was formerly a sort of

proverb that "one of the rewards of philosophy is long life." Homer, Pythagoras, Galen, and many others of the ancient philosophers, exceeded the fourscore years allotted to man by the inspired Psalmist, and the intellectual giants of our own Republic in its early days, such as Franklin, Jefferson, and Adams, were alike blessed with unusual length of life.

But brain work, to be thus beneficial, must be regulated with the most scrupulous care, for nothing can be more foolish than the mistake which ministers, lawyers, physicians, merchants, and mechanics so often make, of disregarding the hygienic laws which they strictly obey in regard to muscular exertion, and acting as if their brains were quite indestructible and perfectly competent to continue as long, or as constantly in operation, as their own wishes or necessities may require. "As a consequence of such habits," says Dr. Isaac Ray, one of our highest authorities upon this subject, "it is not strange that every form of mental infirmity should have increased among us of late to an extent that has no parallel in former times. In the prime of life, in the midst of usefulness, men suddenly break down with their brains, to employ a popular phrase, 'used up' by insanity, paralysis, etc., and this with a frequency which is full of instruction, if we would only heed the lesson. Paralytic affections, which were once comparatively rare, and attributed in great part to hereditary predisposi-

tion or sensual indulgences, now occur in multitudes who have no family taint, apparently enjoy good health, and have from childhood been regular and temperate in all their physical habits. Indeed, were we to indicate that feature in the mental constitution of our times, which distinguishes it from all others, it would be our large proportion of *cerebral affections*."

In order to arrive at some definite conclusion as to the portion of each twenty-four hours which may, on an average, be safely spent in intellectual labor, it is important to determine at what time of life the mind of man is in its prime, and from what has been shown by special inquiries upon this point, it would appear that the period of each individual's existence, extending from thirty years on the side of youth to forty-five on the side of age, is that in which the body enjoys a maximum of vigor and power of endurance, and it is during this same period that the history of studious men leads us to believe that the mind displays similar attributes. Hence, after the age of forty-five, or at any rate of fifty years, every brain worker should, without waiting to be warned by the premonitory signs of failure in the great tool of his trade, systematically diminish the amount of labor which he calls upon it to perform.

The great question of how a man may use his brain without endangering its health, and consequently its practical efficiency, constitutes a separate problem,

however, which must be worked out for each individual case independently, because, although there are often instances where it is easy to say this or that person is overtaxing his powers, it is impossible to fix upon any general rule which would not require too much of some and too little of others. Endeavoring to make all due allowance for this difference, we may say that few individuals, even in the prime of their mental and physical vigor, can exceed six hours a day of close mental application without seriously endangering their health, and that for most persons prudence would direct that not more than five or even four hours daily should be thus employed except as an occasional effort to meet special emergencies.

Intense devotion to study for ten or twelve hours daily, if kept up for months, or even for weeks, has, as a rule, no real advantage, even if the brain should happen to escape permanent injury, because the memory and reasoning powers become so exhausted by fatigue that they actually assimilate fewer ideas than they would do if not so unjustly overtaxed.

No more mournful example of punishment for wilful violation of the "six hours' law," given above, can be found in recent times than that of Sir Walter Scott, who, while in his prime, used to declare that six hours daily was all he could profitably spend upon his wonderful literary compositions. In later years,

when, for the purpose of relieving his pecuniary embarrassments, he was induced to exceed this limit, his brain-power became exhausted with the excessive labor to which it was goaded, and his towering intellect tottered to its fall. His last years were passed in hopeless imbecility, and he died in this condition at a comparatively early age.

Business pursuits which keep the mind more or less upon the stretch for eight or ten hours daily, are generally interrupted by periods of comparative leisure, so that the ill effects of constant mental effort are avoided. But few communities cannot point to instances of prominent lawyers, merchants, railway, or bank officers, etc., whose devotion to the important affairs under their charge has spurred them on to take home their business cares at night, (instead of locking them up in their offices or counting-rooms as regularly and securely as they do their fire-proof safes,) and in consequence must, after a few years of this violation of Nature's inexorable law, retire into the country or take a trip to Europe to remedy, *if possible*, a threatened softening of the brain, or attack of paralysis.

Such an individual is sometimes carefully warned by mother Nature of his approaching misfortune, but as these cautions are by no means always vouchsafed, no man is secure in neglecting the rules just laid down until he thus receives a mild reproof for his transgression. The "notice to quit" mental over-

work is ordinarily served somewhat after this fashion. The business man who is practising the cruelty of over-work upon his patient, long-suffering brain, finds that his day's occupation is becoming a toil rather than a delight, and the last hour grows to be a strain, only maintained by a conscious effort of the will. The last row of figures, or the letters at the bottom of the file, seem interminable, and anything out of the usual routine, making demands upon the higher faculties, is shrunk from as an arduous and distasteful task. With this soon appears an exaggerated susceptibility to every trivial annoyance, the result of that irritable condition which always accompanies weakness of nerve-matter. Another warning symptom is the failure of memory, which, beginning with a difficulty of recalling names, soon extends (if the degeneracy goes on) to a provoking forgetfulness of places and individuals. Occasionally this failure of recollection takes the form of loss of consciousness of a certain event or series of events, which is as complete as though an entire leaf had been torn out from the book of memory. Such an intermittent failure of mental power should always awaken the careless subject of it to his imminent danger, and lead him at once to reform his habits of intellectual intemperance.

Among the physical symptoms of impending exhaustion of brain-power, one of the most important is probably the inability to sleep, of which I have

already spoken. Sometimes this morbid vigilance, as it is called, occurs to the extent of lying awake throughout the nocturnal hours; at others, a light, restless slumber, haunted by dreams which reproduce the waking anxieties, and consequently broken and unrefreshing, takes the place of the needful repose. When this condition of affairs has lasted for a month or six weeks, the only hope is, generally, to be found in a radical change of scene, habits, occupation, and mode of life.

Remember that it will not do to wait for these cautions against overworking the brain, because, in a large proportion of cases, they arrive only after irreparable injury is done, or never come at all. In such instances the sinner against sanitary law receives his first warning *with* his punishment, in the shape of a stroke of apoplexy and paralysis, an outburst of insanity, or an attack of softening of the brain.

"Living fast" is a phrase in common use among many people who rarely recognize that it expresses a grim truth in regard to intellectual as well as physical life; for a man can, and often does, live through his physiological capital in fifty years, when, with care, he might have made it last to eighty or ninety. Oftentimes we can have our choice at the outset of life; but the day comes, it may be very soon, when we must decide which pathway we will follow, and then we should remember that all experience proves we cannot live both fast and long.

CHAPTER XV.

PARASITIC ENEMIES, AND HOW TO ESCAPE THEM.

THE large and important class of diseases which are due to the invasion of our bodies by visible and easily recognized parasites, such as the trichina worm found in pork, only requires a very small ounce of prevention to be escaped completely. I can, therefore, I hope, secure my readers against an immense amount of suffering or ill health by supplying to them a few rules in regard to our means of protection against these minute but dangerous foes of humanity.

Among our parasitic enemies, the Trichina spiralis, or pork worm, deserves to be first mentioned, just as Beelzebub is always spoken of before his imps because of his much greater power for evil to the human family. In spite of all the remedies yet tried for the malady which it produces in man, a large proportion of the cases prove fatal, and even those that recover do so after weeks or perhaps months of suffering.

The history of our knowledge respecting the trichina worm is an excellent example of how micro-

scopical investigation of disease has been of immense benefit to humanity. Previous to the investigations of Dr. Zenker, of Dresden, in 1860, cases of trichnious disease were supposed to be unusual forms of typhoid fever and of inflammatory rheumatism, or, when connected, as they sometimes were, if they occurred in whole families at once, with the eating of pork, were attributed to some peculiar poisonous putrefaction of the meat. The Dresden microscopist, however, discovered that the painful symptoms and terrible mortality of this puzzling complaint were due to the infection of the patients with the young trichina worms, which are hatched out in the intestines of unfortunate people who eat diseased pork, burrow their way through the muscles to all parts of the body, and, by the irritation they set up as so many millions of little moving splinters in the flesh, cause the suffering and death so common in this malady. Their number is sometimes very great, and with them, indeed, as with most of the parasites which infest us, nature appears to have done her best to compensate for their wonderful minuteness by rendering them terrible through their almost infinite number. Thus, it has been found that a cubic inch of pork may contain nearly a hundred thousand trichina, and Dr. Thudicum calculated that there were twenty-eight millions of young worms in the muscles of a patient he examined.

The trichina disease comes on generally with vio-

lent vomiting and diarrhœa, followed by high fever, with severe pains in the limbs, back, and head. For some time it can scarcely be distinguished from acute poisoning, or sometimes from typhoid fever, but about the seventh or eighth day of the disease, a peculiar dropsical swelling of the eyelids and root of the nose appears, and indicates the true nature of the malady.

The trichina worm is very hard to kill, and withstands salting and smoking of the pork in which it exists without difficulty. All pork should, therefore, be carefully inspected with the microscope before it is exposed for sale, and, as an additional precaution, it should never be eaten without *thorough cooking.* Even a very minute fragment of the innermost part of a ham which escapes being heated nearly to the boiling-point of water, may convey several living trichina into the stomach of a person who eats it, and give rise to this painful, often fatal, disease.

Trichina worms are chiefly found in pork, but are also met with in the flesh of rabbits, cats, rats, and mice.

The tape-worm is another parasite which not unfrequently inhabits the stomach of man and gives rise to serious, dangerous, or even fatal symptoms. It has a wonderful life history, which I have not space here to recount, and after sundry transmigrations through the ox, pig, or sheep enters our own bodies, generally

in consequence of eating raw or *underdone* beef. According to Pappenheim, the change of cooked meat from its *red* to *brown* color, which is due to an alteration in the blood-corpuscles by heat, takes place at a temperature of about 150° Fahrenheit, and below this degree there is no certainty that the eggs or young of the tape-worm or of the trichina are killed. Tape-worm sometimes makes its way into our systems by way of salad, celery, cucumbers, or other green vegetables eaten uncooked and without thorough preliminary washing.

Scabies, or the itch, formerly called the "seven years' itch," because, until our microscopes revealed its cause in the tiny Acarus scabiei, it was so hard to cure, is a not uncommon parasitic complaint, and very easily transferred to a healthy person who happens to touch a diseased one, especially at night. I once knew a case in which a whole family were infested from a monthly nurse, who had the disease in its usual seat between the roots of the fingers on the back of the hand; so that it is wise to look carefully for little inflamed pimples in these positions before shaking hands with strangers, and to give a glance at the fingers of nurses who have charge of children in whom you are interested. A single female itch-insect, although it is only about as big as a grain of writing-sand, will quickly burrow its way into the skin, lay its eggs, and rear a family of tens of thou-

sands in a few weeks, which rapidly overrun their territory and drive their new landlord almost to distraction if unmolested by medical treatment.

Probably our most common yet least dangerous parasites are the intestinal worms which not infrequently infest children, and are also sometimes met with in adults. Occasionally these internal inhabitants give rise to severe nervous symptoms, but as a rule they are much less injurious than timid people imagine. Hence, the indiscriminate use of irritating vermifuges is to be strongly deprecated as the far greater evil.

The vegetable parasites which have been proved to affect human beings, belong to the class of fungi or moulds, and give rise to Favus or scald head, Ringworm, barber's itch, etc. The seeds or spores of these diseases may be conveyed from the diseased to the healthy by putting on hats or bonnets, gloves or other clothing, sitting in the same seat, using the same towels, brushes, combs, or razors, or even touching the same articles of furniture. One of my own children had a spot of favus break out underneath her chin, no doubt from being planted with a few seeds of the disease (invisible to the naked eye), by touching her face to the sill of a car-window, where some other child affected with favus among its hair had rubbed the back of its head, and left a few spores of the fungus. Fortunately, I recognized the nature of

the eruption, by the aid of the microscope, before it had time to spread, and by poisoning the parasitic plant with corrosive sublimate, avoided the development of a very troublesome and disgusting disease.

The precautions ordinarily taken to avoid barber's itch, by having an individual cup and razor, are not sufficient, because the seeds or spores are so minute that fifty or a hundred might easily be conveyed to a new patient by means of the strap used for sharpening different razors, the towel placed around the neck, or even by the hands of the barber himself. An instructive case, full of a double warning to my young lady readers, is that of a gentleman in New England who became infected with this repulsive disease about his lips in consequence of a "foul shave;" and, incredible as it may seem, about two weeks afterwards a young lady, to whom he was very attentive, came to her physician to be cured of a well developed ringworm *upon her cheek!*

Children are probably often affected with ringworm of the face and hands from playing with kittens or puppies, in which the fungus, causing this disease, is quite common, and generally shows itself by destroying the hair in such a manner that bald spots upon the head, paws, etc., of the animals are produced. Horses and ponies have sometimes been the sources of contagion in a similar way, and in fact we cannot be too careful to avoid contact with diseased animals of any kind.

CHAPTER XVI.

OLD AGE, AND HOW TO MEET IT.

THIS little volume may be most appropriately brought to a close with a short consideration of the changes of advanced life, and the methods devised by sanitary science to render them as far as possible more endurable. It has been a matter of surprise to thinking men in all ages of the world, that the approach of death should be shrunk from by old people almost as shudderingly as by those in youth, or in the prime of life. Such, however, as every-day experience teaches us, is not infrequently the case, and a large majority of mankind hold the same view as that entertained by the aged, but witty Frenchwoman, who sent for her physician, on one occasion, and, in reply to her catalogue of ills, was met by the exclamation, "What would you have, Madame? I cannot make you young again!" "I know that, Doctor," answered she. "What I want you to do is to *help me to grow old a while longer.*"

For the purpose of aiding my elderly readers who are not yet tired of life, and who desire to *grow old*

comfortably for some years more, perhaps even to see what the year A.D. 1900 will do for science, art, and humanity, I will briefly glance at the symptoms of bodily decay, in the order which they are apt to make their onset, and in the same concise way point out how to diminish their interference with the powers of life, and their disturbances of health.

One of the first signs of wearing out is the decay or falling out of the teeth, which loss leads to serious derangements of digestion, as a consequence of the necessarily imperfect mastication or chewing of food. The complete breaking up of our more solid articles of diet, and their thorough mixture with saliva, are indispensable preliminaries to their solution in the stomach and intestines, upon which our vigor largely depends. Hence, it is well worth while for us to avail ourselves, to the utmost, of the skill and ingenuity displayed to such an eminent degree by practitioners of the dental specialty in medicine, which generally enable them to prolong for many years the usefulness of decayed teeth, and finally to substitute for them artificial molars and incisors, which perform their vicarious office with wonderful success.

When, as sometimes happens, the dentist's art fails to serve the required purpose, care must be taken to have all kinds of solid food cut or ground into very small pieces before it passes the lips. After it enters the mouth, articles of diet (whether solid, and thus

artificially prepared; soft, like boiled rice or milk toast, or liquid, such as soups or meat extracts) should not be swallowed immediately, but ought to be mixed with saliva by moving them round in the mouth for a short time, about as long as they would require for mastication if the teeth were in perfect order. See Primer on "The Mouth and the Teeth."

Another important change very liable to accompany advancing years, is the excessive deposit of fat, which, unfortunately, often occurs just at the time when the muscular powers are deteriorating a little, and the corpulent condition, therefore, interferes with taking sufficient bodily exercise to insure uninterrupted good health. This tendency may be diminished by attention to diet, and its unfavorable influence is often quite important enough to render faithful observance of the rules for avoiding obesity profitable. Calcareous or chalky degeneration of the arteries, etc., is a common and serious mode of decay in advanced life, due in part, perhaps, to errors in diet.

The failure of muscular power directly dependent upon the want of complete renewal of all the muscular fibres, which go to make up the muscles in the shrunken and shrivelled limbs of old age, is another very common milestone upon the declivity of life. Mournful as it is to see the former athlete shorn of his long boasted strength, this deprivation would have but little direct effect in hindering the attainment of

long life, were it confined to the muscles under the control of the will alone. Unfortunately, however, the same loss of muscular tissue, and therefore of muscular power, takes place in the involuntary muscles, and occurring consequently in the heart and the semi-voluntary muscles which inflate the lungs by expanding the chest, renders the vital functions of the respiration and of the circulation of the blood feeble and imperfectly performed. Of course, we have no means of examining the heart, for example, and seeing whether in any particular individual this waste has begun, but we possess, under certain limitations, a very sure guide to its existence in the manifestly greater difficulty of breathing on attempting to run, or climb a hill, or even a high staircase, so common among persons over sixty, and almost universal among those over seventy-five years of age. Another result of feebleness of action of the heart and muscular-coated arteries is the coldness of the hands, feet, and limbs, due to the slowness and imperfection of the circulation of the blood, which wanders lazily along through its vessels with a torpor in painful contrast to the bounding pulses of vigorous youth. This torpor of the vital current leads to a kind of chilliness of the extremities of aged people which no amount of outside wrappings will remedy, for, like King David of old, though covered with clothes, they get no heat. Artificial warmth is therefore absolutely

necessary, and in extremely cold weather, elderly people in whom this symptom is at all marked should remain in-doors, and within the influence of well-regulated fires. Many an otherwise long life is cut short at threescore, or threescore and ten, by an attack of bronchitis, lung-fever, or inflammation of the membranes of the heart, etc., from want of knowledge, or want of care, in regard to the necessity of this precaution.

Still another dangerous effect of this muscular wasting (or senile atrophy, as physicians call it) characteristic of old age, is the weakening of the natural worm-like movements of the intestines, accomplished by millions of little involuntary muscles, which, during vigorous life, propel the food at a proper rate through the alimentary canal, but after the age of fifty or sixty lose some of their efficiency, and, as a consequence, permit to be set up that torpor or constipation of the bowels which is so common, so troublesome, and so injurious in advanced life.

The management of these various failures in the different muscular organs of the body to do their proper share of work, is as simple as it is practically difficult for most persons to carry out. An individual in whom they have occurred is exactly in the condition of a wealthy man whose fortune has been diminished by hard times until he finds he must either reduce his expenses or trench upon his capital. If

elderly people, whose allowance (or income) of muscular strength has been reduced by the "hard times" of threescore and ten, to one-half of its amount during the prime of life, can only be persuaded to live within the bounds of this diminished income of vitality, existence may generally be prolonged for a considerable additional period; but if, on the contrary, they will persist in endeavoring to perform the feats of agility, of strength, of endurance, *and of digestion*, which were the pride of their youth and their prime, their bodily capital is trenched upon, their remaining stock of vigor, which, prudently husbanded, might well have lasted another twenty years, is soon exhausted, and speedy death is the result.

I cannot too strongly reiterate what has been already advised in regard to the use of laxative food, injections, and mild purgatives in constipation, and urge their special importance in avoiding torpor of the bowels in the aged. Congestions and secondary affections of the liver, blind or bleeding piles, and vertigo, or even apoplexy, during the act of straining at stool, are some of the penalties paid by old age for neglect of these safeguards.

Sometimes hand in hand, sometimes preceding or succeeding, at some little interval, to these failures in the muscular tissues, are seen the evidences of deterioration of brain- and nerve-structure displayed in the loss of intellectual power, with changes of temper

and even of disposition. Such alterations are slow; they often commence insidiously, and develop almost imperceptibly, escaping the attention of the subject of them, for the simple reason that they affect the organ of perception of external impressions itself. Very frequently they are distinctly visible, to a close observer, long before the state of dotage is recognizable by the ordinary eye.

There is no doubt that, under these circumstances, life and intellectual vigor would often be prolonged by a judicious change of occupation and of scene, particularly in foreign travel; and marked failure of memory, loss of reasoning power, or capacity for mental application, are the symptoms which should warn elderly people of the approach of intellectual decay, which, however, the means just suggested may avert, or, at least, for a long time postpone. Should these danger-signals be disregarded, as is the case in a large majority of instances, the time when they can be of service is apt to pass quickly by, and the perchance once vigorous intellect, wrecked and ruined, falls into a condition of decay which renders long life a grievous burden, not only to the sufferer himself but also to the loving relatives and anxious friends who surround him.

THE END.